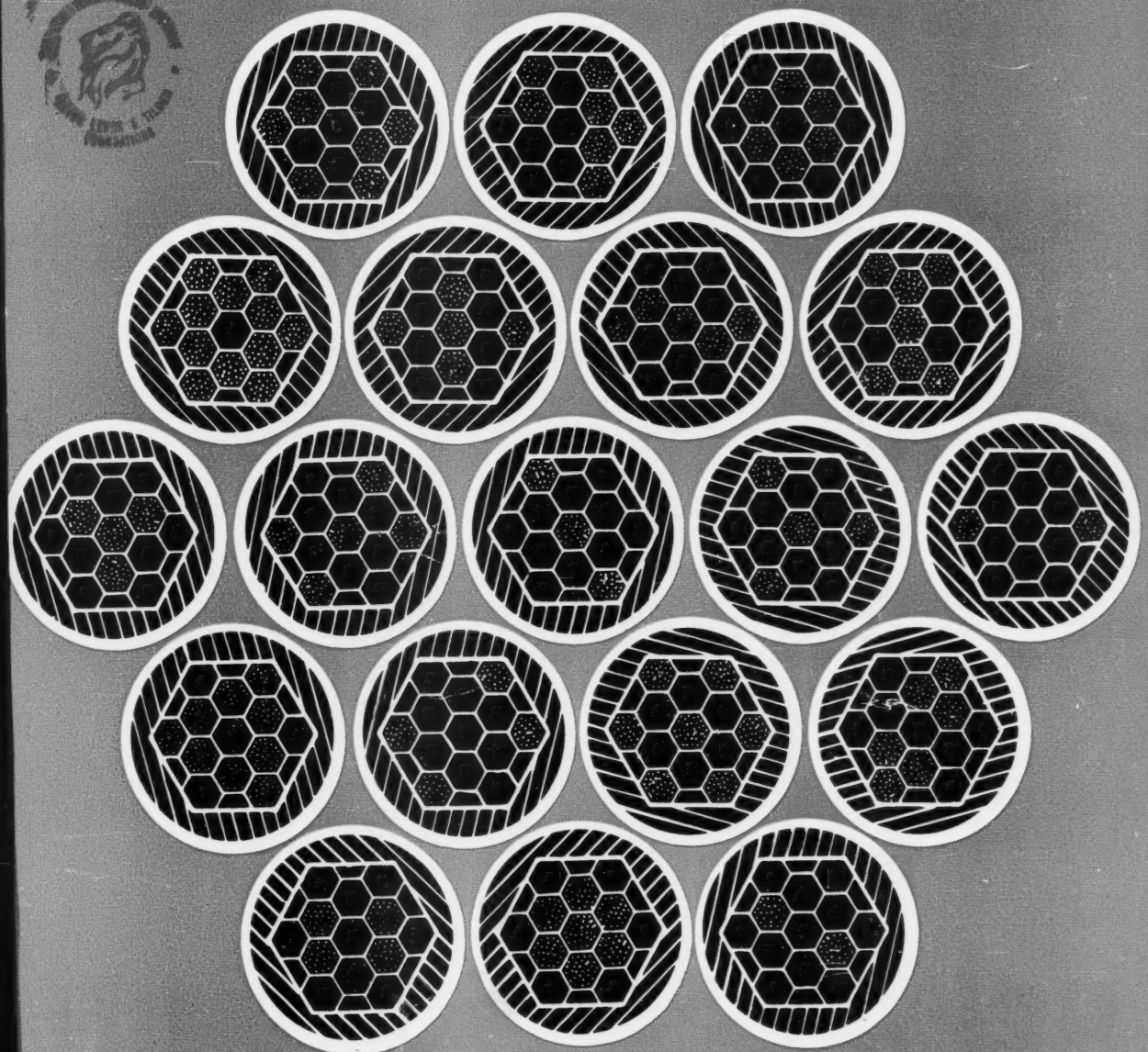
Design Engineering

APR 9 1959

FIVE DOLLARS A YEAR



April 1959

Production Show preview. . . . 45

Pin-up panels 38

Torsion bar springs. 54

PUBLISHED BY THE MACLEAN-HUNTER PUBLISHING COMPANY LIMITED, TORONTO, CANADA

News! The best features of modern bearing design combined and refined in

Spherical

SELF-ALIGNING ROLLER BEARINGS BY LINK-BELT

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Your Link-Belt office will gladly explain the many performance advantages evolved with this new design. It can furnish full data on industry's most complete line of ball and roller bearings . . . pillow blocks and flanged, flanged-cartridge, cartridge, and takeup blocks.

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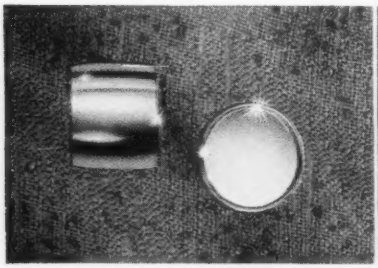
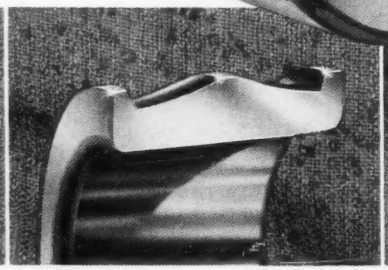
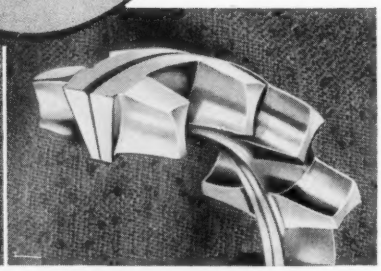


BIG, HIGHEST-CAPACITY ROLLERS. Each bearing has a maximum number of rollers—as large as possible, yet all components are in optimum balance.



HIGH, HEAVY INNER RACE FLANGES present convenient hold for assembly and removal of bearing without cutting away shaft, avoid any need to skimp on shaft shoulders.



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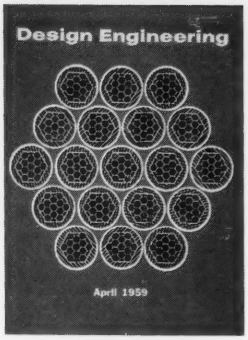

Design Engineering

Vol. 5 APRIL 1959 No. 4

THE NEW YORK PUBLIC LIBRARY ASTOR LENOX & TILDEN FOUNDATIONS

This month's cover

Many people who saw this month's cover on our pin-up board, thought it was a bird's-eye view of a clutch of cables. One fellow even thought it was a new kind of amoebic salami. We cut the buffoon cold — but truth will out. It's a selection of torsion bar springs discussed in the Mordasewicz article you'll find on page 54.

Design Engineering

MEMBER

CCAB

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VDA DESIGN

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FOR MANY PURPOSES
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ALATHON* POLYETHYLENE	Densities from 0.914 to 0.930; melt indices from 0.3 to 20; wide range of stiffness, clarity, gloss, shrinkage. Outstanding processability over whole range of properties.	Film; moulding (housewares, etc.); pipe; wire insulation; cable jacketing; extrusion coating of paper, cloth, etc; blown and thermoformed.
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ZYTEL* NYLON RESIN	High strength and fatigue resistance over wide temperature range; excellent abrasion resistance, low friction co-efficient. Easily moulded in properly adjusted equipment. Special extrusion grades available.	Wear parts for machines (bearings, gears, cams, bobbins, toggles, etc.); locks; hardware; plumbing fixtures; fasteners; wire and cable jackets and sheaths; switch parts; heat and impact resistant housings; oil resistant tubing.
DELRIN* ACETAL RESIN	Exceptionally high strength, stiffness and fatigue resistance; high heat resistance; low friction co-efficient; low water absorption. Easily moulded in properly adjusted equipment. Extrusion grade available.	Mechanical parts; hardware; pipe fittings; tool parts and housings; extruded tubing and trim.
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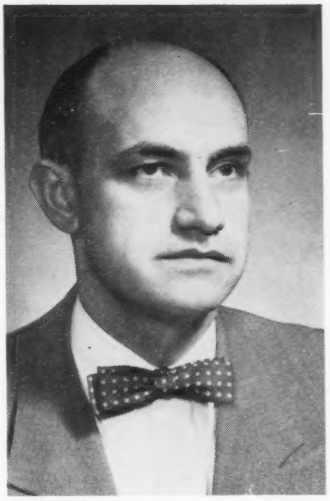


CADIEUX

Vp is avid outdoorsman

Water skiing, boating, swimming, hunting and fishing (woodworking too) are some of the hobbies of **Joseph H. Cadieux,** vp of Casting Engineers Inc. Before he took over this job he was vp manufacturing for Misco Precision Casting Co. and in earlier years was associated with the Ford Tractor and Implement Div.—and was in charge of its chemical laboratory.

* * *

DE author gadding about Europe

This was an especially difficult month in getting biographical details and photos from our contributors. We are beginning to think design engineers have a collective "clam up" trait. After putting out three calls to **Michael Aumont,** Mrs. A. wrote us from New York where her husband is a mechanical design consultant. She told us that he was in Europe on a business trip "and as far as biographical details are concerned, he received his engineering education in England, was with the British technical civil service before coming to New York. He has also done consulting work in Canada for several years." We thank you Mrs. A. and regret lack of photos.

* * *

Part II man

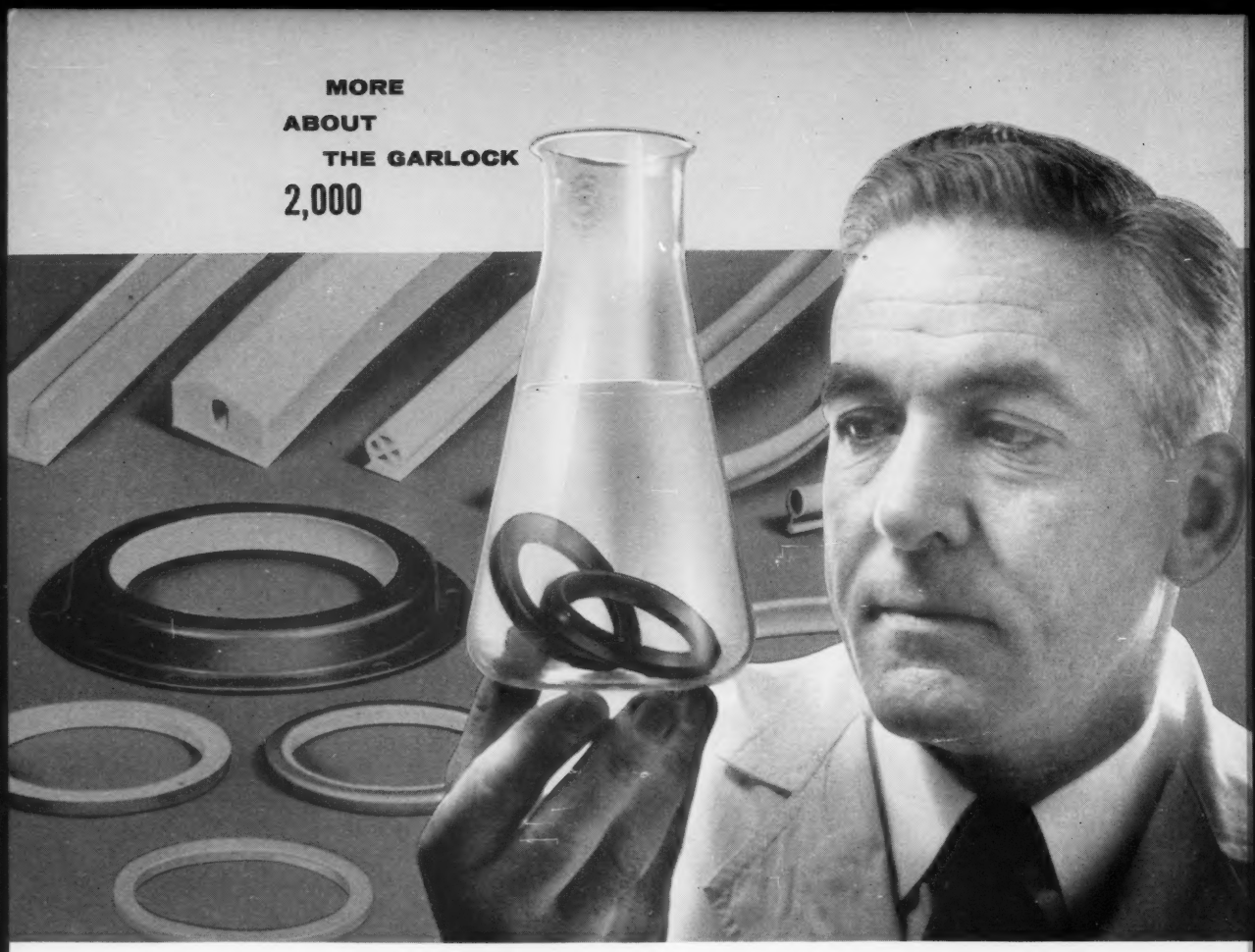
Stan Mordasewicz' wind-up article on torsion springs is included in this issue (see Feb. 1959 DE for his background).

* * *

Lecturer and instructor too

His job as fire control officer aboard USS Mobile in World War II fanned **A. James Waldron's** interest in instrumentation. Since then he has worked on rocket engine research, and instrumentation projects with other companies before joining Catalytic Construction Co. where he is division engineer, instrumentation. Besides writing about his job, Jim Waldron is active as a lecturer and instructor and is a national chairman of the Instrument Society of America.

WALDRON



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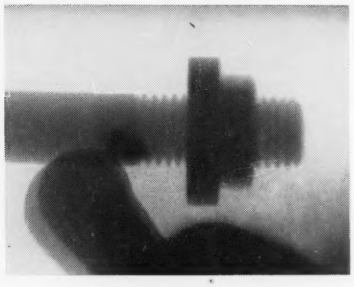
Reports

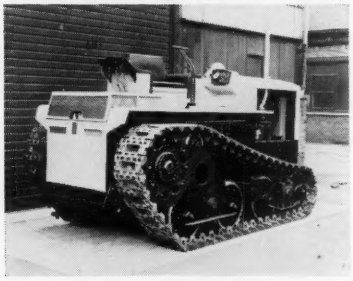
A news roundup of items of engineering and design interest from the world over

Your plant feeling a bit seedy? Call the pipe doctor



Of course he won't give you a prescription for pills, but he might give you a pretty accurate diagnosis. Being sympathetic towards pipe corrosion (human or otherwise), we determined to sound out the diagnostician himself. But we got bowled over when the president of the firm answered the phone himself. "We're pretty busy these days, and I'm holding the fort till the staff get back from lunch," said Mr. T. Arnesen, which gave us a chance to ask what the Tru-gauge technique was all about. "Well it's radiographic and looks through pipes, vessels and tubes to determine the amount of scaling or corrosion. It's very accurate—and testing is done while the plant is in operation." We thanked him and hoped the Sarnia Inspection Co. staff were quick in getting back. Mr. Arnesen sounded mighty hungry.

Pick you up at seven in our hydrostatic convertotract



Autos being the price they are, we might just plunge for one of these jazzy tractors equipped with all the home comforts. There are a mere handful of principal components in the hydrostatic transmission (positive displacement oil pumps drive positive displacement motors) to go wrong. And operation . . . well it's just a matter of juggling those two levers you see sticking up in front of the fireside chair. They steer and regulate the stepless travel speeds from zero to a flashy seven mph in both forward and reverse. And for people used to making fast in-flight decisions, the change from one direction to the other is practically instantaneous. In case you have baronial acres to manicure, it's an eight-ton Bagnall-Burns 90.

The strange case of the switching talkspurts

The two inoffensive-looking gents in the photo are holding part of a system which is expected to double the number of telephone conversations carried by underseas phone cables. Its name is a bit of a mouthful — Time Assignment Speech Interpolation — but it capitalizes on silence. In an average two-way phone conversation, one of the parties speaks half the time only — even then there will be speech gaps. Thus, if the two directions of transmission are separated, each path is idle more than half the time. Shoelacing two lots of conversations together is what this system does, and the Bell Telephone labs are ringing in these changes on silence 8,000 talk samples a second.

You can't pension-off rhenium in some jobs

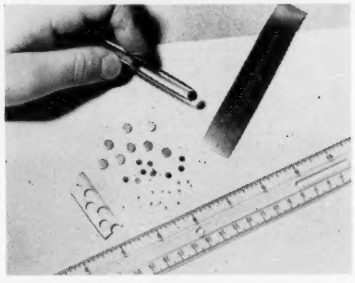
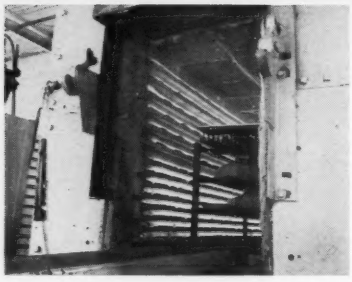


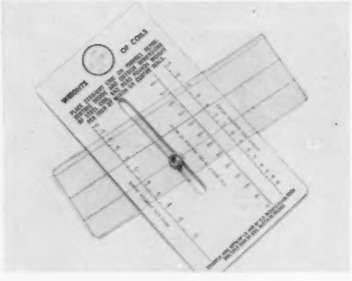
Photo shows electrical contact discs blanked from rhenium strip. An extremely dense, silver-colored metal, rhenium has a melting point of 5,756 deg. F, surpassed by one metal only (tungsten) and carbon. With such a high melting point and high strength at elevated temperatures, it is an important engineering material. While not a structural metal, it holds great promise as a possible welding material for molybdenum, either in its pure state or alloyed with molybdenum. For certain electrical contacts, rhenium shows a life expectancy 20 times greater than other currently used materials. Rhenium metal is being produced in limited quantities at Chase Brass and Copper Co. through powder metallurgy.

Kick out the bricks and bring in the foam



New materials often bring with them simpler ways of performing elaborate and expensive tasks. For instance, we were informed the other day of an interesting replacement job. The Broome Porcelain Co. wanted to enlarge the firing chamber of their furnace to handle architectural panels up to 50 in. by 96 in. Normally, this would mean dismantling the brick roof and building up the outer metal shell of the furnace to gain an extra two feet of space. Here's where modern materials came to the rescue. The refractory brick roof itself was 30-in. thick —not unusual in a 40-year-old furnace. But two rows of 3-in. thick "Foamsil" blocks did the job—even eradicated the need for a roof arch. Manager John Clark is pleased with it all.

The folder cursor did the trick

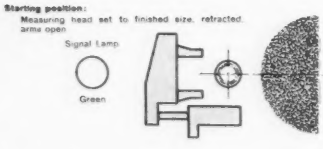


While not a true miniaturization process, this pocket calculator performs a function usually associated with large sheets of paper and long rulers. An Oakville, Ont., firm was asked to produce a nomogram for calculating the length and weight of steel coils. Printed on each side of a .020 polished vinyl card 2½ in. by 5 in., some sort of straight edge had to complement the card. Rather than have a separate item (apparently usual with nomograms), a folded cursor was made which extended the full length of each side of the card but allowed it to move freely within a vertical, die-cut slot. Hairlines on cursor allow easy readings. The John Wilkes Press came up with the idea.

But you don't keep this peeler in the kitchen drawer

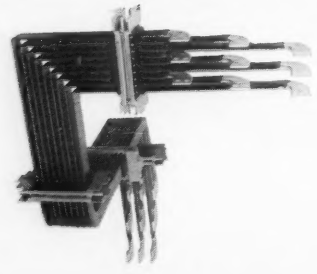
Peeling the tough hide of electric wires used to be a chore that sometimes sent the sparks flying. In fact it was in Georgia, the Firecracker State, where this new method of splicing hydro wires was first used, we believe. To operate, the peeler is hooked over wire or conductor, tightened by hand until a stop is reached, then rotated around the wire until the "chip" falls away. Of course a turn too many would have you twanging a celestial harp in no time. But all that's been taken care of by those stainless steel "ee's." They come in 134 different sizes, each type designed for a specific conductor and thickness of covering. Method was developed by Penn-Union Electric Co.

Yodelling and cheese are not the only Swiss exports



At left, the starting position for an automatic measuring system for cylindrical grinders for which a consistent accuracy of 40 millionths of an inch is claimed. Electronically controlled, the Movolimit-Deltalimit system is made up of three separate units —the measuring head, indicator instrument and a measuring and control amplifier unit. There are two different methods of operation. For mechanical type grinders the unit may be used as a single piece measuring system and for repetitious work on hydraulic machines it is calibrated electrically to a master component. System (made by Fritz Studer of Switzerland), is being used by Lucas-Rotax of Toronto; is one of few units in Canada.

Prima ballerina of a bus bar is a cool bender



We have met a couple of prima-ballerinas, but none as angular as this photo. However we have it on pretty good authority that this copper bus in "L.D." busways is playing an important role in the Cornwall hydro power station of the St. Lawrence Seaway project. It carries the power from transformers to panelboards, in a 21-bar, 4,000-amp ventilated set-up. It had to be soft enough to take bending operations—yet rigid enough to support its own weight; ability to bend edgewise without cracking; and be corrosion-resistant among other requirements. Taylor Electric Co. use special Noranda copper for the job—guard their method with a Zildjianish secrecy. ★

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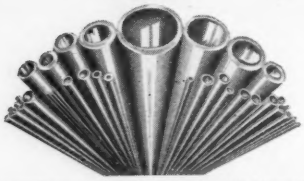

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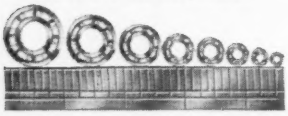

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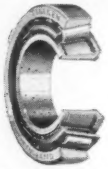

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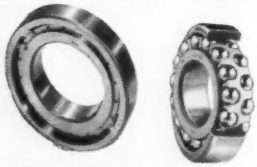

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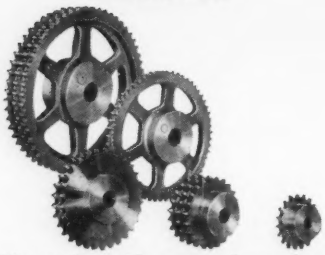
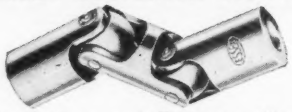


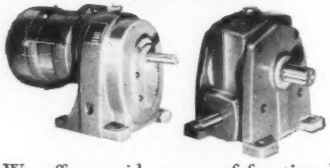
We stock a wide range of sprockets to fit all sizes of A.S.A. Roller Chains. #35 to #200. Can supply any style of hub, A.B. or C.

ESSEX UNIVERSAL JOINTS



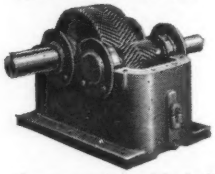
Heavy Duty and Precision Single and Double Type Universal Joints from stock. Also joints made of special materials, for marine and particular applications.

MOTOR GEAR



We offer a wide range of fractional and medium H.P. Spur and Worm reduction gear units, with or without motors. Hi-ratio spur reduction gear adaptor to enable overall ratios as high as 1200: 1. Delivery from stock.

REDUCER UNITS



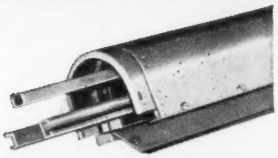
A line of spur and double helical reduction units with parallel and right angled shafts and different combinations. This is a heavy duty line up to 6000 H.P. ratings and high ratios.

FOR PROTECTION UNDERFOOT!

MORTON KASS SAFETY TREAD

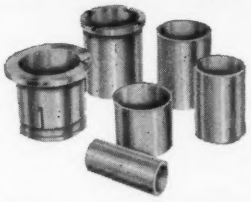
for Floors, Steps, Ramps, Platforms. Grips more surely. Renews grip by wear.

KEYSTONE INTEGRATED ALUMINUM CONDUCTOR SYSTEMS



The most complete modern system high current capacity with minimum voltage drop.

JOHNSON BEARINGS

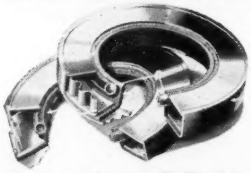


Self Lubricating — Cast Bronze — Graphited Bronze, etc. Stocks of General Purpose bearings ¼″ to 4½″ ID and Ledaloyl self-lubricating bearings ⅛″—4″ ID are immediately available from stock in Montreal, Toronto and Winnipeg.

WALDES TRUARC RETAINING RINGS

Whatever you make, there is a WALDES TRUARC Retaining Ring designed to save material, machinery and labour costs. Precision engineered, quick and easy to assemble, always circular to give a never failing grip. Thousands of sizes in stock from .010″ thick upwards.

SUPERFECT OIL SEALS



Complete stocks of SuPerfect Oil Seals ¾″ OD to 11″ OD in Chrome tanned leather, Supertan leather, Pretan leather and Synthetic rubber are carried in stock at all Lyman warehouses.

Write for details and catalogues covering product in which you are interested.

LYMAN TUBE AND BEARINGS, LIMITED

MONTREAL TORONTO
HAMILTON LONDON
WINNIPEG VANCOUVER NEW GLASGOW, N.S.

Circle number 138 on time saver card

WHY ARE SO MANY SCHOOL SEATS MADE OF vibramix?

Because VIBRAMIX has proved virtually child-proof . . . AND this — you will admit — is test enough for any product, let alone school furniture.

Other reasons are the big savings effected with VIBRAMIX as a molding compound . . . as a faithful reproduction which eliminates machining . . . often as a one-unit solution to complex multi-piece assemblies . . . and always as an end product without weak spots.

Amazing VIBRAMIX is a polyester molding compound with reinforcing filler such as glass fibre or asbestos, in any colour you wish. It readily obeys medium pressures and heats, by standard compression or transfer molding.

You may find it very profitable to learn all about VIBRAMIX. Enquire, too, about Naugatuck's full line of resins for 'custom' mixing on your premises. For complete information or technical assistance, contact Naugatuck Chemicals at Elmira, Ontario, or our branches in Montreal, Toronto, Winnipeg or Vancouver.

OTHER SPECIAL FEATURES: Good heat and dimensional stability • excellent electrical properties • no glass preforming, resin mixing, preheating or post-curing • short molding cycles.

OTHER NAUGATUCK PRODUCTS

VIBRIN - MARVINOL
KRALASTIC
AND RESINS FOR PREMIXES

Naugatuck Chemicals

DIVISION OF DOMINION RUBBER COMPANY LIMITED

Circle number 139 on time saver card

1959 DESIGN ENGINEERING

CONVENTION HALL • PHILADELPHIA

TO GET MORE OUT OF THE SHOW...
Attend the Design Engineering Conference

Sponsored by the Machine Design Division
American Society of Mechanical Engineers

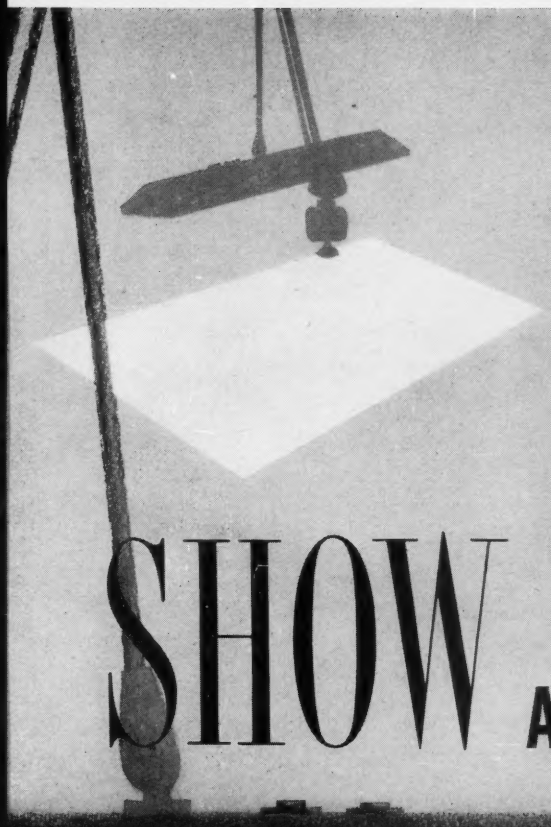
You'll hear searching examinations of the major problems of product design and development by outstanding experts in your field. The three major areas of product design — mechanical, electrical and materials — will be taken up in separate sessions. You'll participate in panel sessions aimed at giving you answers to specific questions, helping you profit from the ideas and solutions of others, and providing a more meaningful perspective on the responsibilities of your job.

Don't miss the *must* event of the year for everyone connected with product design, research and development.

Write for your Registration Cards today!
Send for as many cards for yourself and your colleagues as you wish.

Write: CLAPP & POLIAK, Inc. • Exposition Management
341 Madison Avenue, New York 17, N. Y.

Circle number 116 on time saver card



The idea show for everyone concerned with product design, research, and development.

375 of the nation's leading manufacturers showing mechanical, electrical and electronic components, metals, non-metallic materials, fasteners, finishes and coatings, shapes and forms, hydraulic and pneumatic components, power transmission, research and testing equipment, engineering equipment and services. Thousands of products to help you do a better design job and reduce manufacturing costs.

SHOW AND CONFERENCE

MAY 25 • 28, 1959

ACTION DEMONSTRATIONS
Exhibits feature working models, cut-aways, technical illustrations—to bring you as close as possible to the product story.

ENGINEERING PERSONNEL
Bring your blueprints. Exhibitors staff their booths with engineers. They can help engineer your problems on the spot.

PERFORMANCE TESTING
Wherever possible, products will be subjected to performance tests to prove to you, in person, their capabilities.

CATALOGUES AND TECHNICAL LITERATURE
Hard to obtain technical data is available at the source. Exhibitors make available to you their published data in one place—at one time.

PRODUCT APPLICATIONS
Exhibitors in this show concentrate on displaying imaginative applications of their products to suggest design solutions.

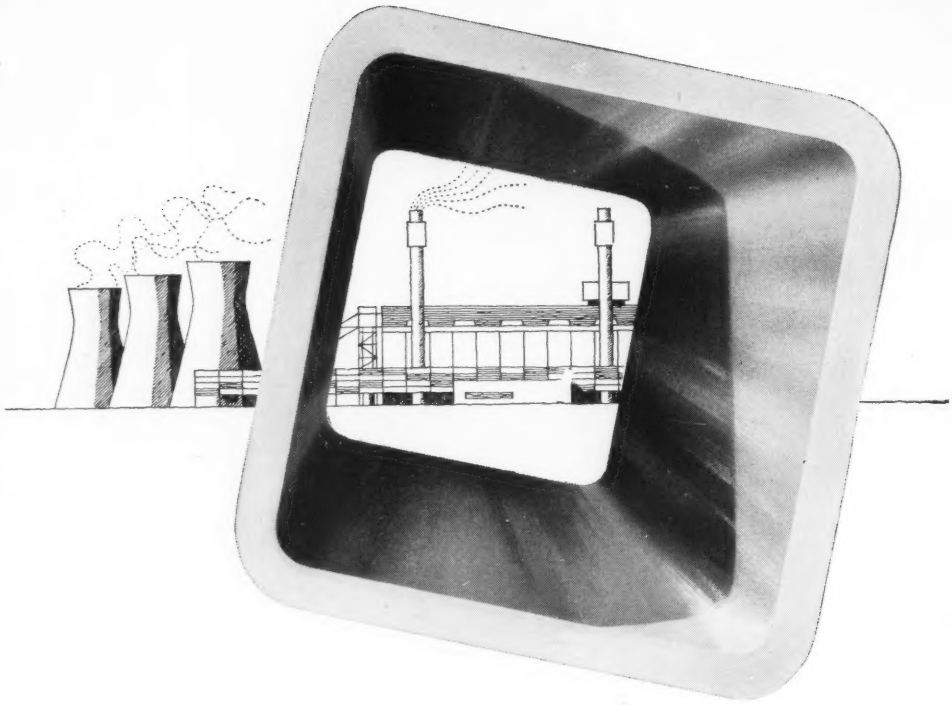
NEW SOURCES
Within the ranks of some 375 exhibitors, you'll find new sources of supply for materials, products, components, and services you require.

PRODUCT COMPARISON
Check competitive claims immediately by going from one booth to another.

SAMPLES
Take home for trial and test actual samples of products you're interested in. Most often they're available in exhibitors' booths.

IDEAS
Your eyes will be opened to thousands of applications, suggestions, demonstrations, that can spark new thinking—speed your designs to a successful conclusion.

Circle number 116 on time saver card



WHAT'S IN A TUBE?

In every Chesterfield tube there is a lot of experience that doesn't show on the surface. Whether we are drawing a header for the boiler of a power station or turning out a miniature gas bottle to inflate a life-jacket, we make use of manufacturing techniques and individual skills that have taken anything up to 50 years to perfect. There is no substitute for the experience that goes into ***chesterfield tubes.***

THE CHESTERFIELD TUBE COMPANY LIMITED · CHESTERFIELD · ENGLAND · A T.I. COMPANY

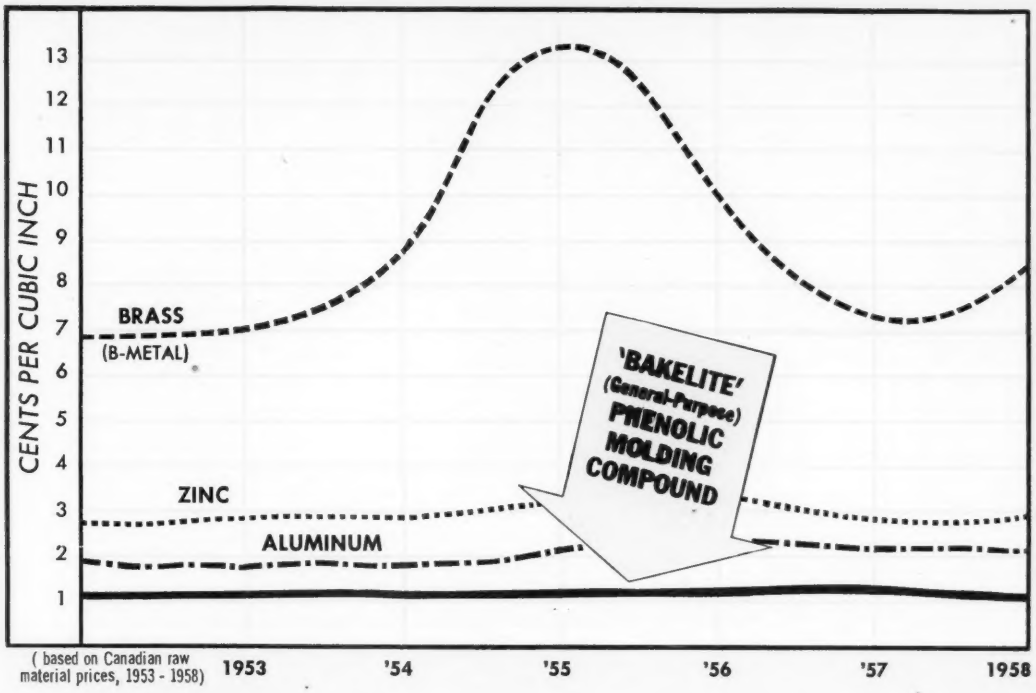
Canadian Representatives: STANDARD TUBE AND T.I. LIMITED, WOODSTOCK · HAMILTON · TORONTO · OTTAWA · MONTREAL

CRC 60

Circle number 115 on time saver card

'BAKELITE' Phenolic Compounds

CAN BE YOUR KEY TO PROFITS...



COMPARE THESE UNIT COSTS...

CHECK THESE PROPERTIES:

- ✓ Good impact strength
- ✓ Excellent electrical insulator
- ✓ Light in weight
- ✓ Quality appearance
- ✓ Warm to the touch
- ✓ Good machineability
- ✓ Heat resistant

This chart graphically illustrates, in cents per cubic inch, the low cost of "Bakelite" general-purpose Phenolic Molding Compound compared with costs of other component part materials. In actual fact, the price of this versatile material is lower today than it was in 1953.

"Bakelite" Phenolic Compounds are readily molded into a wide range of shapes and sizes for the production of component parts. In view of their low cost and excellent inherent properties, as listed, it will pay you to investigate their use when designing new parts or considering an economical replacement material for existing parts.

'BAKELITE' Phenolic Compounds

UNION CARBIDE TRADE MARK

BAKELITE COMPANY
Division of Union Carbide Canada Limited
TORONTO • MONTREAL • VANCOUVER

"Bakelite" and "Union Carbide" are trade marks

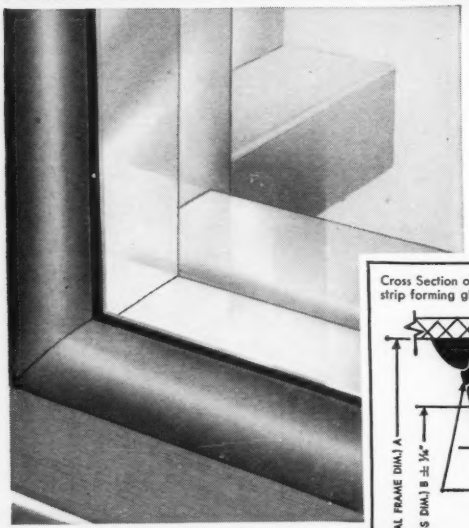
A CHIEF SUPPLIER OF PLASTIC RAW MATERIALS TO INDUSTRY

Circle number 106 on time saver card

Extruded NEOPRENE Weather Strip

AN EFFECTIVE GLASS-TO-METAL SEAL IN CURTAIN-WALL CONSTRUCTION

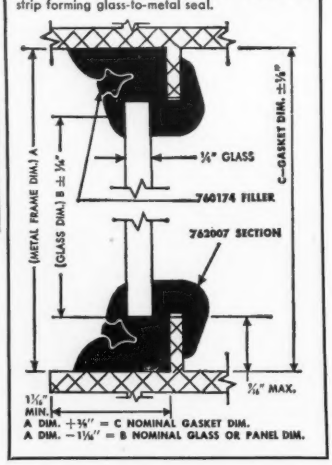
Prack and Prack, Architects, Hamilton, Ont.



NEOPRENE weather strip supplied by Crystal Glass & Plastics Ltd., sales agents for "Inlock Structural Weather Strip". Curtain-Wall fabrication and erection by The Macotta Company of Canada Ltd.

Sharp crisp lines of windows are typical of this form of construction with NEOPRENE

Cross Section of extruded "INLOCK" NEOPRENE strip forming glass-to-metal seal.


(METAL FRAME DIM.) A
(GLASS DIM.) B ± 1/16"
C—GASKET DIM. ±1/16"
1/4" GLASS
760174 FILLER
762007 SECTION
7/16" MAX.
1 3/16" MIN.
A DIM. +3/4" = C NOMINAL GASKET DIM.
A DIM. −1 1/16" = B NOMINAL GLASS OR PANEL DIM.

Other advantages are:

- ✶ Easy to install and seal
- ✶ Naturally resilient—needs no binders or cement to maintain moisture-proof seal
- ✶ Resists deterioration due to moisture, exposure, ozone
- ✶ Needs no paint or finish

For Economy, Efficiency and Better Design— Specify

NEOPRENE WEATHER STRIP

DUPONT CANADA

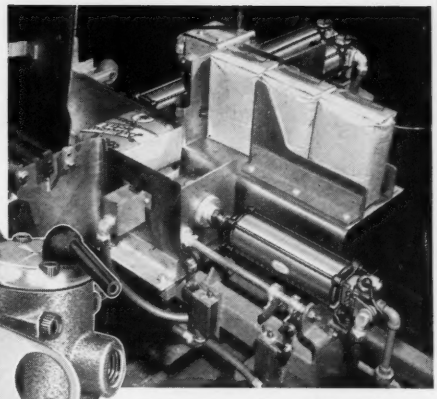
BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Circle number 121 on time saver card

with the

BELLOWS AIR MOTOR®

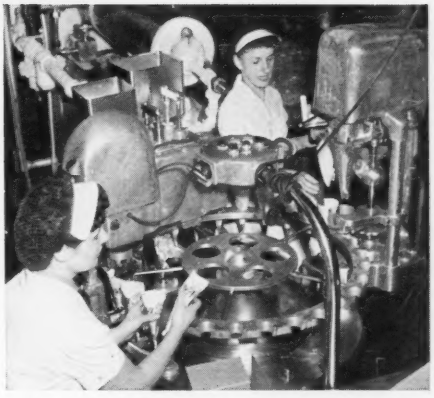
MADE IN CANADA



Packaging coffee is simplified by this Bellows Air Motor powered equipment.

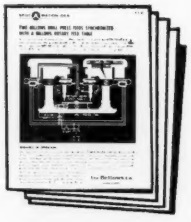
...you can build special machines ...or modernize existing machines *at low cost and quickly!*

With parts normally available in every tool room, plus one or more Bellows Air Motors, and a little creative ingenuity, you can "spot modernize" scores of operations whose high cost whittles away at profits. The few illustrated here are typical of hundreds we can show you. The chances are good that no matter what you make, nor how you make it, this versatile air cylinder, with its *built-in* electrically controlled valve, can lend a mighty important helping hand to your cost reduction program.



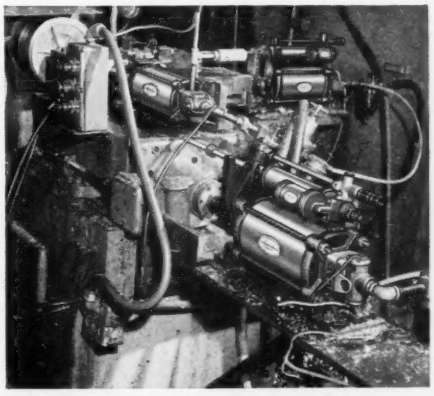
Bellows Air Motors fill ice cream, add nuts and fudge, fold and seal the wrapper in this special machine.

THIS FREE "SPOT-A-MATION FILE" MAY SPARK AN IDEA IN YOUR MIND THAT CAN MEAN IMPORTANT COST SAVINGS



A note on your letterhead addressed to Dept. DE459, Bellows Pneumatic Devices of Canada, Ltd., Toronto 18, Ontario, will bring you basic data: wiring diagrams, installation details, equipment list, on a score of "everyday" operations almost every industry uses — and, if you wish, the services of a Bellows Field Engineer, to help you adapt those ideas to your specific needs.

1313B-1



Tail stock, tool bit, and cross-slide are moved by Bellows Air Motors in this lathe conversion.

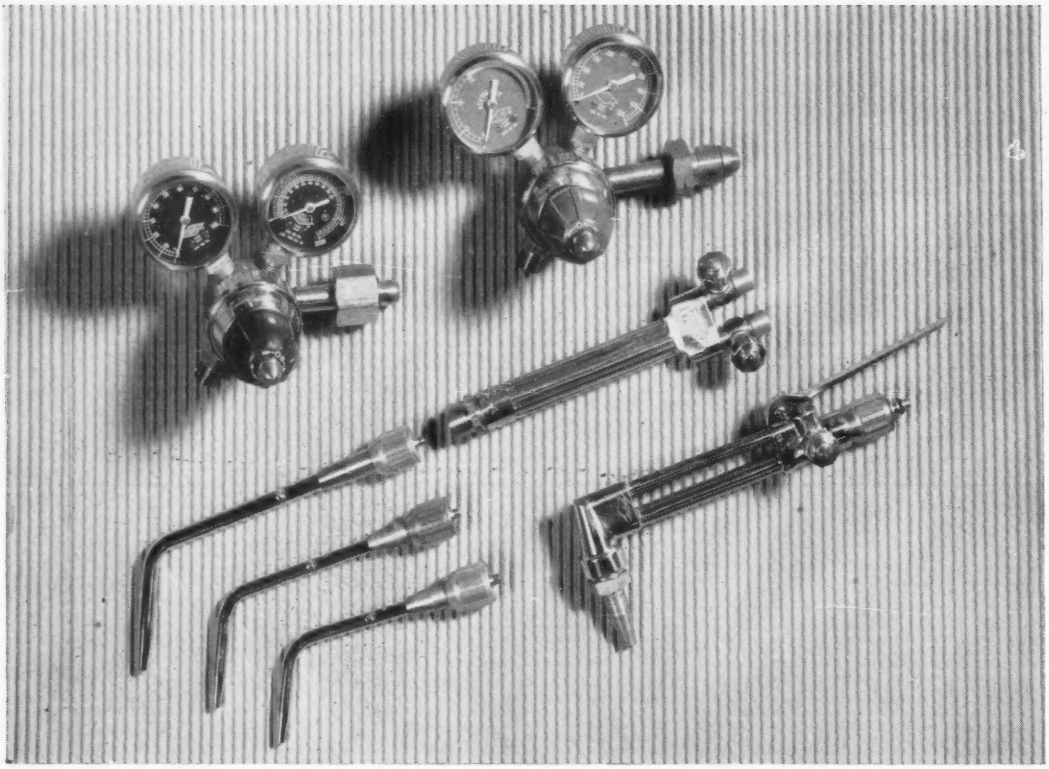
Bellows

PNEUMATIC DEVICES OF CANADA, LTD.
14 Advance Road Toronto, Canada

OTHER INDUSTRIAL DIVISIONS OF IBEC: Sinclair-Collins Valve Co., Valvair, Akron, Ohio • V. D. Anderson Co., Cleveland, Ohio

Circle number 108 on time saver card

A New Dimension . . . Liquidweld



. . . in Regulators

DYNAMIC DESIGN / STABILIZED SEATING

Liquidweld Two-Stage Regulators, both Standard and Heavy-Duty, meet all industrial requirements. They provide uniform flow as cylinder pressure decreases and are designed to absorb inlet pressure shock. Check these other advantages:

1. Diaphragms from special stainless steel.
2. Special metal filter insures longer seat life.
3. Minimum maintenance.
4. Stronger, more durable.

. . . in Torches

WELDING / CUTTING

A complete line now available in Canada, including welding torches for general purpose, medium duty, and lightweight requirements. Cutting attachments for #90, #80 and #70 torches.

Other advantages with Liquidweld Torches:

1. Better handling through proper balance.
2. Longer life-maintenance minimized.
3. Economical operation.

IF IT'S WELDING OR CUTTING IT'S LIQUIDWELD!!!

IMPERIAL OXYGEN LTD.

MONTREAL — TORONTO — WINDSOR — WINNIPEG — VANCOUVER

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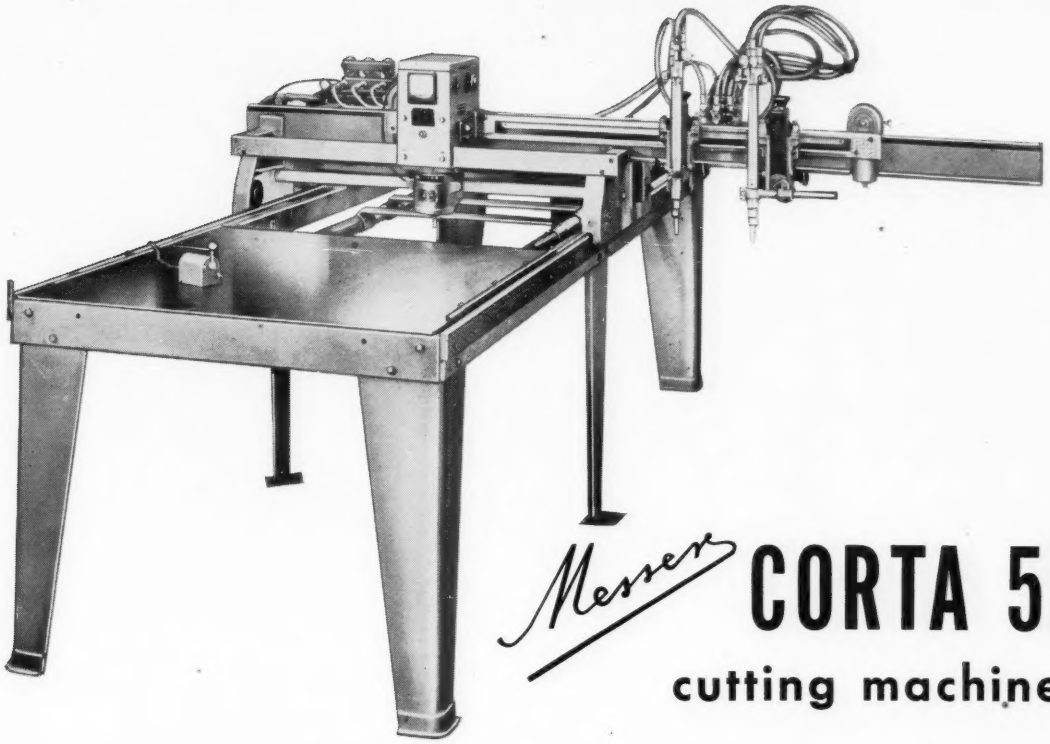
design freedom for shaping metals



Messer **CORTA 52**

cutting machine

The constantly accelerating expansion of industry over the past years has created new demands for faster, more accurate and at the same time more economic means of shaping metals. It is now well accepted that the oxy-acetylene flame cutting procedure best meets these requirements and consequently it is only natural that a company which has been long active in this field now offers shape cutting machines of the most advanced design.

A range of cutting machines is available for any industry engaged in steel cutting; warehouses, steel fabricators, ship yards, car shops and for any manufacturer who produces various machine shapes that must be cut from steel plate. If you are doing any kind of cutting today, you will find it to your immediate advantage to get the complete details on the machine that will do your work best, fastest and at the lowest cost. Your inquiry will be answered promptly and completely.

Featuring . . .

★ MAGNETIC HEAD

★ AUTOMATIC CIRCLE CUTTING ATTACHMENT

★ OPTOSCOPE MANUAL TRACING HEAD

Visit our booth . . .

No. "L" 2-3-4

At the National Industrial Production Show

Toronto — May 4 to 8

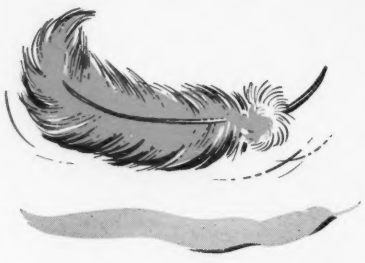
IMPERIAL OXYGEN LTD.

MONTREAL — TORONTO — WINDSOR — WINNIPEG — VANCOUVER

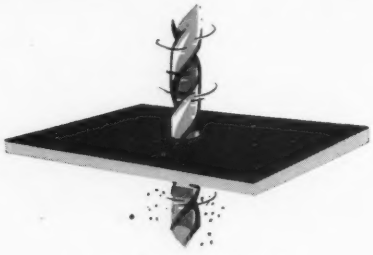
Circle number 161 on time saver card

WHAT'S YOUR PROBLEM?

MECHANICAL STRENGTH?



LIGHTNESS?



GOOD MACHINING QUALITIES?

LOW LOSS ELECTRICAL INSULATION?

SPAULDING MATERIALS SOLVE THEM ALL IN ANY COMBINATION

The properties of Spaulding Materials also include chemical inertness, durability, deionizing qualities and arc resistance. Spaulding makes and fabricates *Vulcanized Fibre, Armite* (Fish Paper), *Spauldite* (Laminated Thermosetting Plastic), *Spauldo* (Rag Paper Motor Insulation), *T Board* (Transformer Board), *Fibreboards* and *Materials Handling Products.*

Spaulding will fabricate its materials in parts to your specifications. Spaulding materials are also available in sheets, rolls and tubes.

Our trained personnel, wide range of products and modern facilities will help solve your design and manufacturing problems. Consult us today.

READY TO SERVE YOU

Our new plant is completely equipped with standard and special machines arranged for the most efficient production of parts made from our materials, and fabricated to your exact specifications.

Additional warehouse space will mean faster service to our many customers across the country.

Spaulding

SPAULDING FIBRE OF CANADA LTD., 70 CORONET RD., TORONTO 18, ONT.

BELMONT 3-2151

5020 McDONALD AVE., MONTREAL, P. Q. HUNTER 8-2945

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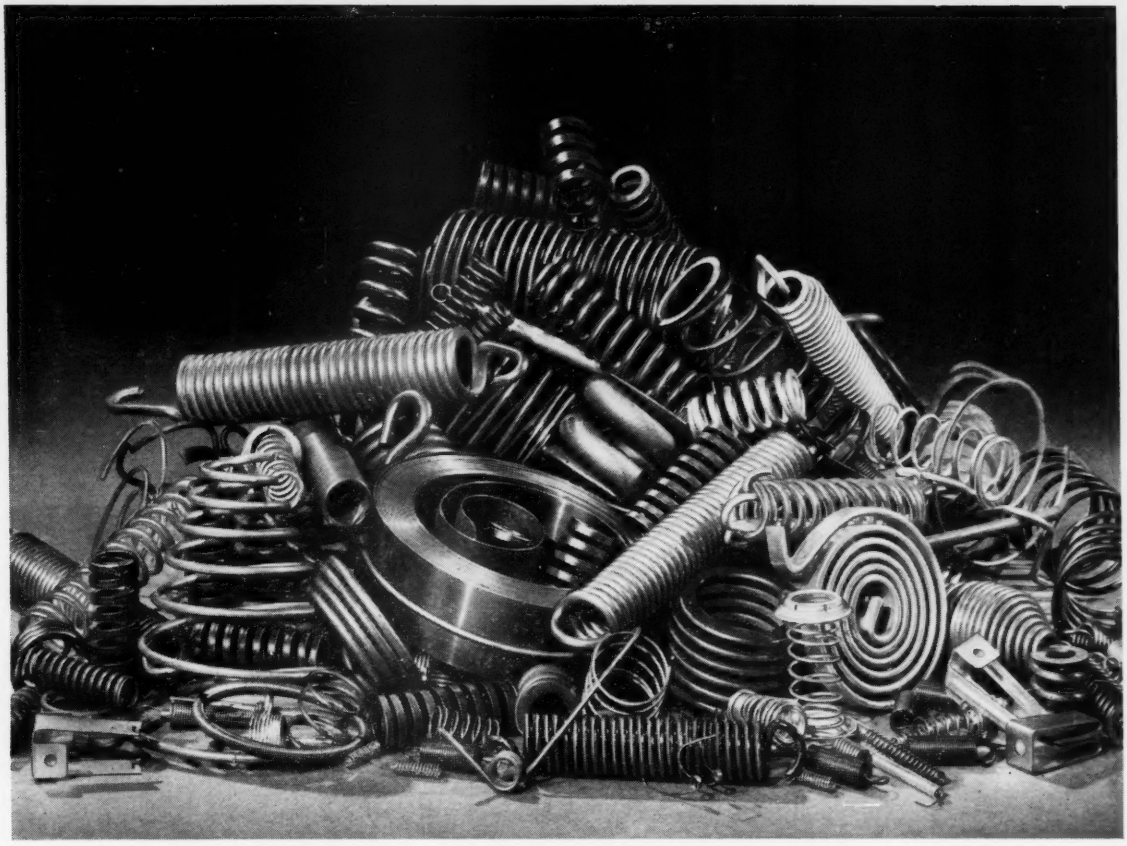

needle in a haystack?

Finding just the right spring can be costly and time-consuming. Even though springs look alike, each is different—depending on the job it has to do. Type, size, tension, temper, stress, and other complicating factors must be considered in their design and manufacture.

If finding the right spring for *your* problem seems like "looking for a needle in a haystack," let the man from Wallace Barnes help you. Our spring engineers are ready to accept your precision mechanical spring problem and help design the *right* spring to do your job *precisely* right.

Send for your free copy of
Spring Design and Selection—in Brief
our authoritative digest on spring engineering

Selecting the right spring is simple . . .

Just call the man from

The Wallace Barnes Company Ltd.

Hamilton, Ontario—Montreal (Pointe Claire) Quebec

Sales Agent: E. A. Tipping Sales Ltd., Winnipeg—Vancouver (Richmond)

Subsidiary of Associated Spring Corporation

64-205R

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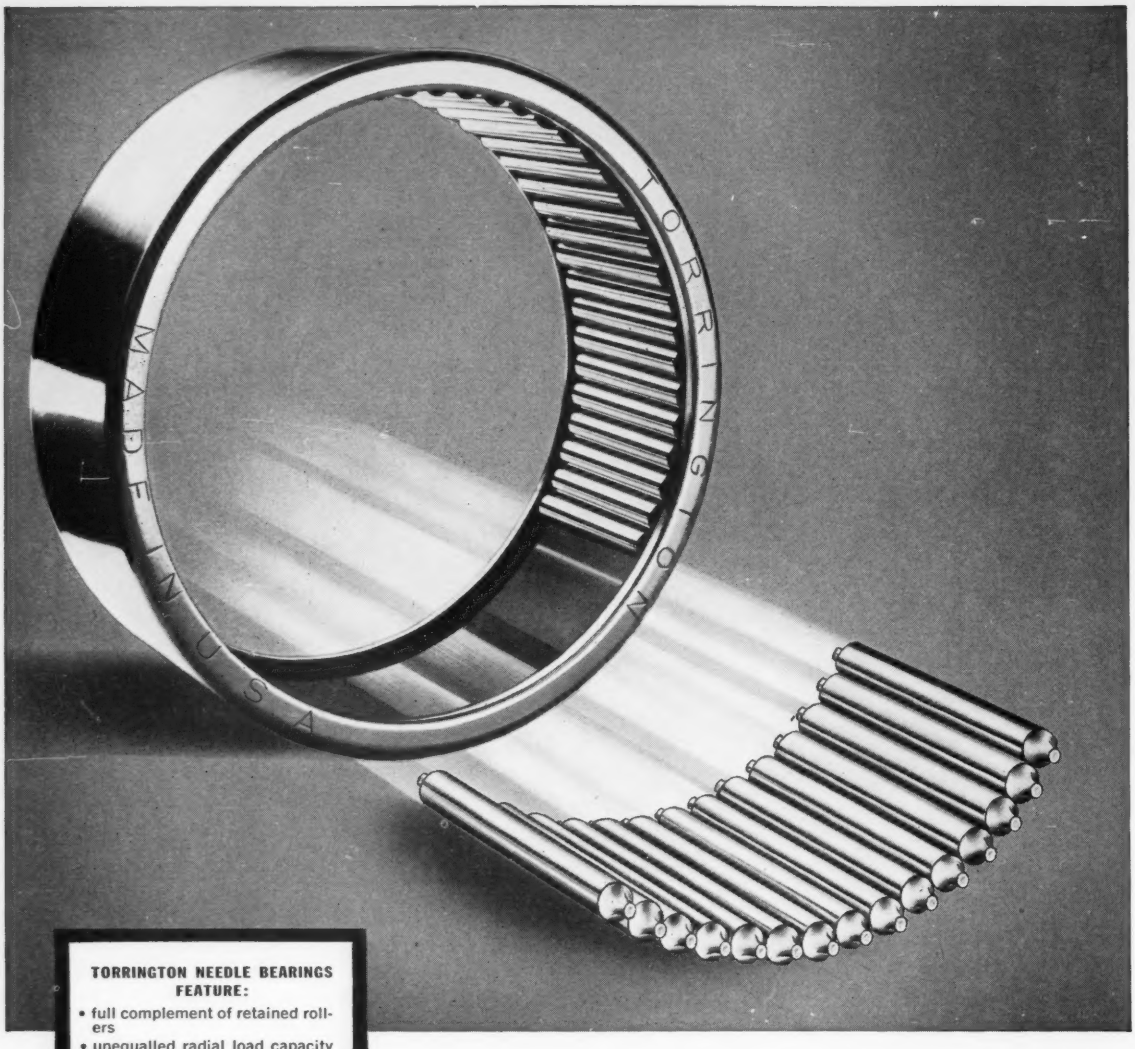
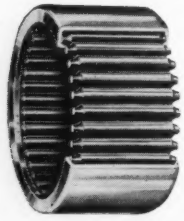


TORRINGTON NEEDLE BEARINGS FEATURE:

- full complement of retained rollers
- unequalled radial load capacity
- low coefficient of starting and running friction
- low unit cost
- long service life
- compactness and light weight
- runs directly on hardened shafts
- permits use of larger and stiffer shafts



Here's Why Torrington Needle Bearings Provide Maximum Radial Load Capacity

The Torrington Needle Bearing's full complement of small diameter rollers provides the largest possible number of bearing contact lines in the load zone.

This feature gives Needle Bearings a higher radial load capacity than any other bearing of comparable size. Precision rollers ensure smooth anti-friction performance with low coefficient of starting and running friction, to match this unequalled capacity. Rollers are positively retained by the turned-in lips of the outer shell, permitting simple, economical installation and assembly.

Torrington experience spans twenty years in design and application of Needle Bearings to equipment of all types. This experience is at your disposal to help you secure the ultimate in performance built into every Torrington Needle Bearing. **The Torrington Company Limited, 925 Millwood Road, Toronto 17, Ont., Canada.**

TORRINGTON BEARINGS

District Offices and Distributors in Principal Cities of United States and Canada

NEEDLE • SPHERICAL ROLLER • TAPERED ROLLER • CYLINDRICAL ROLLER • BALL • NEEDLE ROLLERS • THRUST

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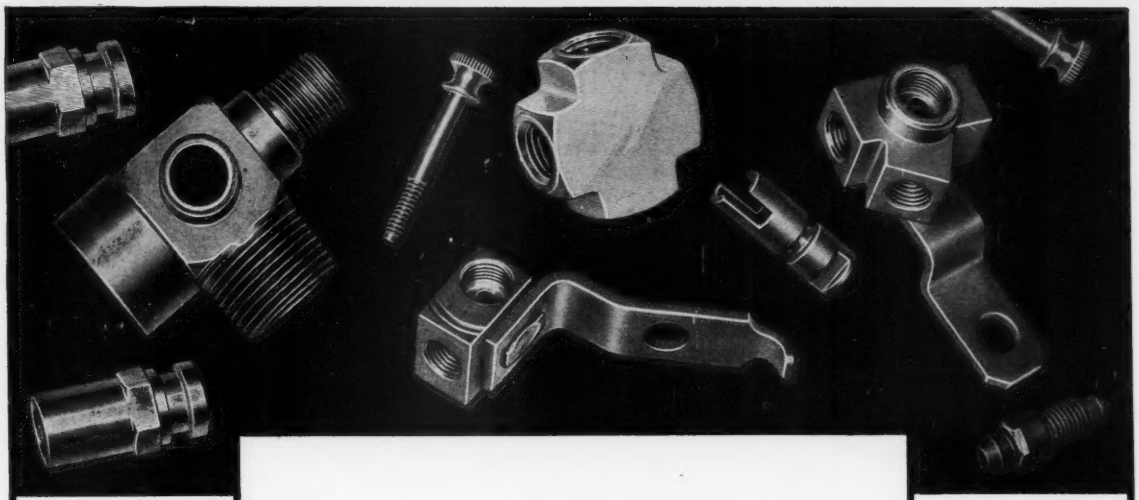
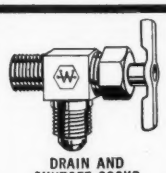
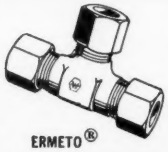


DASH CONTROLS

BRASS



DRAIN AND SHUTOFF COCKS



ERMETO®

Any screw machine part to meet your need

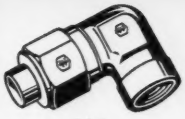
We'll make it out of brass, steel, aluminum or any machineable material to meet your specifications. A battery of 66 multiple and single spindle automatic screw machines (capable of machining from 1/32" through to 2⅝" diameter material) are ready to go to work. For the highest production *quality*, in any *quantity* at the lowest *cost*—call in Weatherhead.

WEATHERHEAD

SCREW MACHINE DIVISION

St. Thomas Ontario

SM-3-8



S.A.E. FLARE-TWIN (J.I.C.)

SELFALIGN®

BULK HOSE AND REUSABLE HOSE ENDS

HOSE ASSEMBLIES

Circle number 157 on time saver card

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A. R. Williams Machinery Western Ltd.

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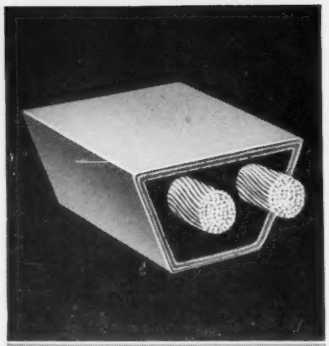
La Fonderie "Universal" Engr.

MARITIMES

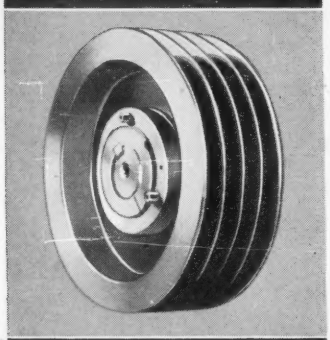
HALIFAX
Foulis Engineering Sales Ltd.

Another good reason for choosing "Texrope" drives is that they can normally be delivered from stock, immediately, by these distributors coast to coast.

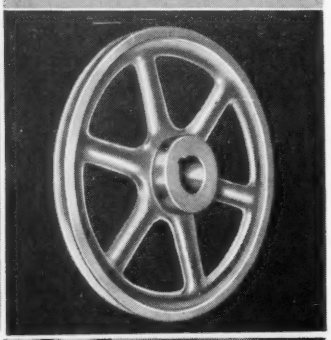
Vari-Pitch sheaves, speed changers and special drives to suit unusual application can be made to order and shipped from the factory.



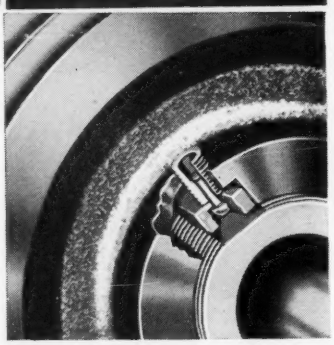
Texrope grommet V-belts



Magic-Grip multi-groove sheaves



Texlite single groove sheaves



Magi-Key adjustable sheaves

Texrope, Magic-Grip, Texlite, Magi-Key, **and** ***Vari-Pitch*** **are Allis-Chalmers trade marks for products manufactured in Canada by the Texrope Division of:**

MADE IN CANADA

CANADIAN ALLIS-CHALMERS

P.O. Box 37, Montreal, P.Q.

59-TR-1

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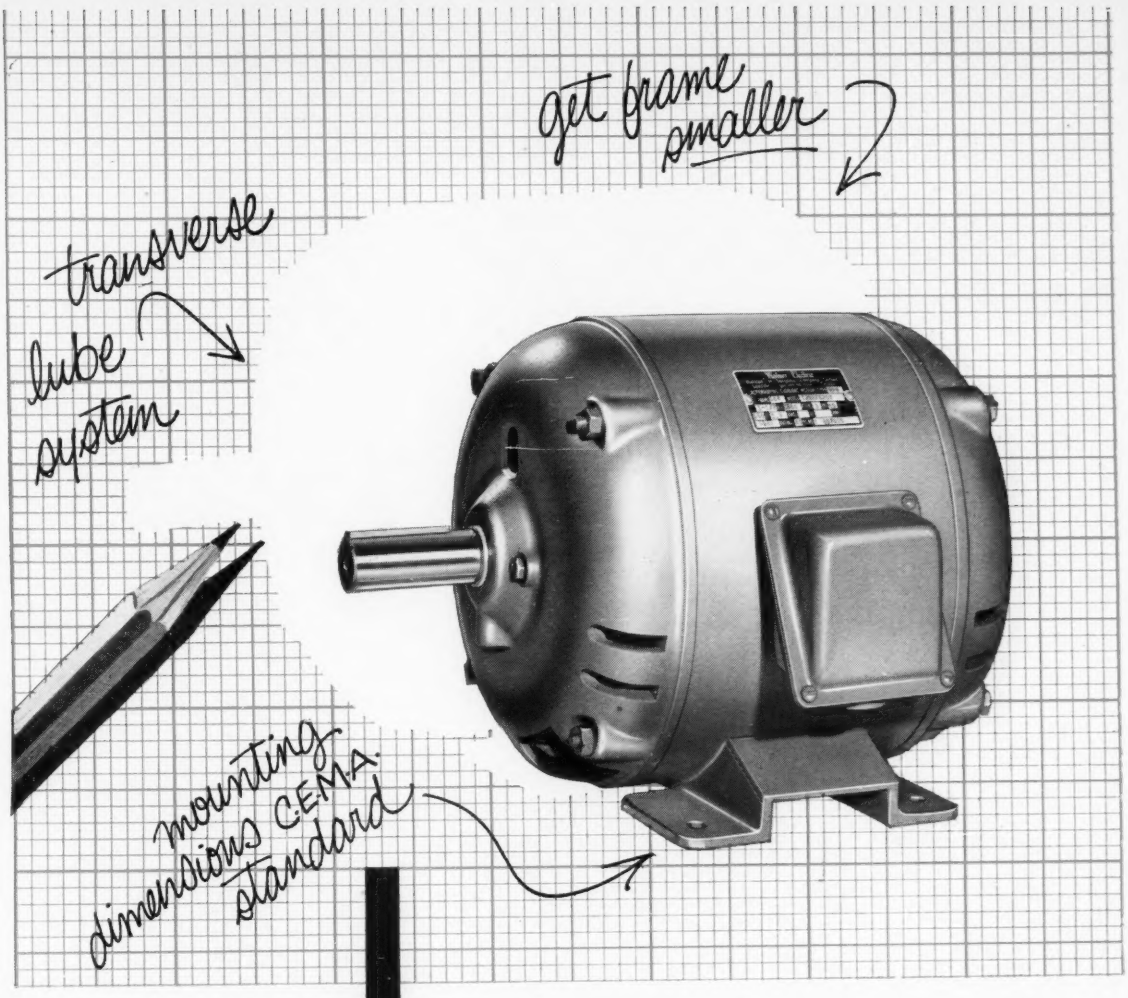

SMALL SIZE

●

MORE RUGGED

SEE OUR MOTOR EXHIBIT AT THE
INDUSTRIAL PRODUCTION SHOW
BOOTH # F-1 MAY 4th TO 8th
INDUSTRY BLDG. C.N.E. TORONTO

G-5877

new smaller frames retain same thickness of material for greater rigidity

The newly designed Wagner 1 to 5 H.P. Polyphase Motors incorporate every important BIG motor feature in a smaller frame. The heavy steel frames, retaining the same material thickness, resist damage and distortion due to handling and mounting. These motors feature the famous Wagner Transverse System of lubrication for trouble-free operation under the most severe conditions. They are built to C.E.M.A. standard mounting dimensions.

For applications where ruggedness is indicated, specify Wagner.

Wagner ELECTRIC

Head Office:
LEASIDE, ONTARIO
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SANGAMO COMPANY LIMITED
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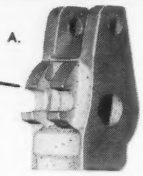
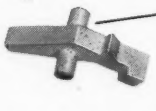
Circle number 155 on time saver card

ACCURATELY PRODUCE YOUR COMPONENTS For Less Cost-- WITH "DELORO" PRECISION CASTINGS

✓ Save Assembly & Fastening Costs
✓ Save Expensive Metals
✓ Save Tooling Costs
✓ Save Machining Time
✓ Save Manpower

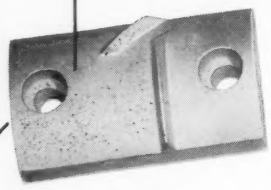
RADII & FILLETS
SMOOTH SURFACES
BOSSES & FLANGES
SHARP EDGES
SHARP CORNERS
ROUND CORNERS
THREADS
ROUND OR SHAPED HOLES



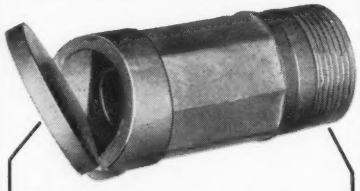


A. Air craft component cast in S.A.E. 4140 for low cost.

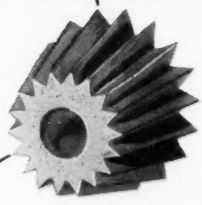
B. Air craft component cast in S.A.E. 4130 for low cost.



Paper cutting die for wear resistance and low cost cast in DELORO Stellite Grade 12.



Liquor recovery furnace nozzle precision cast in DELORO Stellite to resist high temperature, corrosion and erosion. Grade 1 used in deflector plate and battery grade for body.



Cone drill cast in DELORO Stellite Grade 100 for maximum wear resistance and low cost.

Above are some of the expensive machining operations, which can be eliminated with Deloro Precision Castings — Here's more:

- **Counter-sinking**
- **Counter-boring**
- **Broaching**
- **Drilling**
- **Forging**
- **Shaping**
- **Turning**
- **Angles**
- **Contours**
- **Lettering**
- **Yokes**
- **Projections**
- **Profiles**
- **Recessions**
- **Ribs**

MATERIALS —

All castable alloys except cast iron, magnesium, and some aluminums.

DELORO STELLITE
BELLEVILLE ONTARIO
CANADA

QUOTATIONS —

Send a drawing or sample to Belleville, Ontario. Be sure to specify material, inspection standards and quantities.

Circle number 119 on time saver card

*Could be 50,000, 100,000, 200,000, or whatever your production run.

You save time and money every time a Speed Nut is tightened. Multiply this saving by the number of fastening operations on your assembly line and the cost reduction is very significant. What's more, improvement in product performance accompanies this cost savings because Speed Nuts provide a *positive* spring tension lock to every fastening.

There are 8,000 different types and sizes of Speed Nuts now in use. If one of these won't cut *your* costs, we'll design one that will.

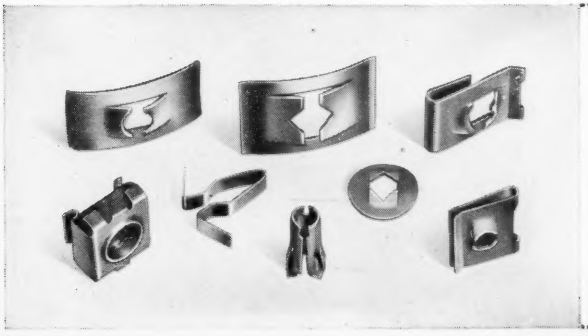
WITH

DOMINION FASTENERS

Speed Nuts®

Exclusive TINNERMAN Canadian Licencee

Take 10 seconds now to fill in this coupon — and you'll save precious seconds thousands of times over to lower your production costs.



DOMINION FASTENERS LIMITED

a Geo. A. Tinnerman *corporation*

HAMILTON, ONTARIO, Sales Branches: Toronto, Montreal

Like most manufacturers, I want to get my production costs down. Please rush complete information on how Speed Nuts can help me.

NAME_____

COMPANY_____

ADDRESS_____

WE MANUFACTURE_____

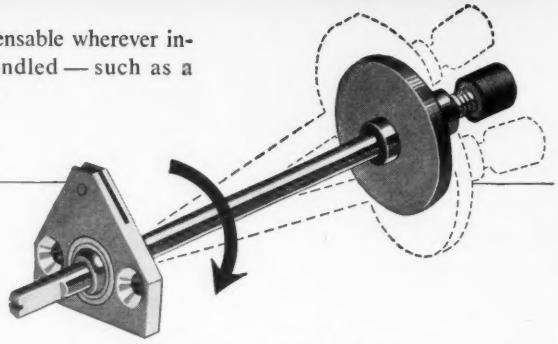
Circle number 120 on time saver card

All the Best Features of a 2-piece Spherical Bearing PLUS_ Self-Lubrication . . . . .

HEIM *Unibal*®

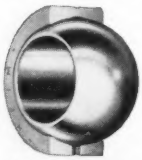
SINTERED POWDERED METAL SPHERICAL BEARINGS

The Heim Spherical Bearing is indispensable wherever intentional misalignment must be handled — such as a rotating shaft requiring lateral motion.

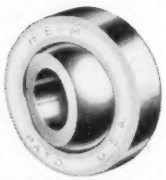


For applications where the bearing is easily accessible for re-lubrication, and where static radial loads to 650,000 lbs. are to be carried, the LH and LRH series Unibal Spherical Bearings are made with outer members of aircraft quality alloy steel hardened, and balls of SAE 52100 steel hardened.

Spherical Bearing made by powder metallurgy method



Cutaway shows large surface-supporting area



Designed to correct maximum misalignment

The same type bearing is now available with balls made of high-density, through-hardened powdered iron alloy, and outer members of sintered iron or sintered bronze with controlled porosity.

Heim Unibal Powder Metallurgy Spherical Bearings are self-lubricating (hold up to 20% of their own volume in oil). Longer bearing life is assured.

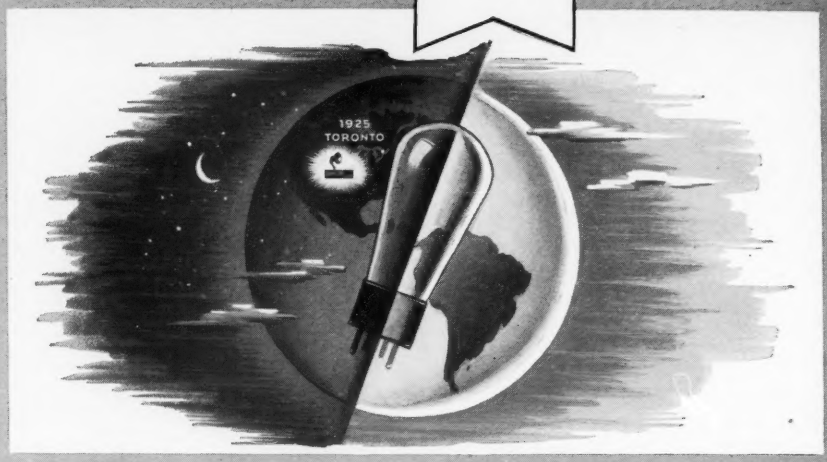
R/M BEARINGS CANADA LTD.

QUEBEC CITY	MONTREAL	WINNIPEG	THREE RIVERS	TORONTO	VANCOUVER	LONDON, ONT.	HAMILTON
755 Blvd. des Capucins	1006 Mountain St.	1302 Notre Dame Ave.	375 St. Georges St.	33&50EdwardSt.	1066 Seymour St.	1024 Oxford St. East	130 Ferguson Ave. N.

FACTORY REPRESENTATIVES AND DISTRIBUTORS FOR CANADA

Circle number 128 on time saver card

A CANADIAN FIRST



THE FIRST BATTERYLESS RADIO IN THE WORLD

IN *1925*, E. S. "TED" ROGERS *began to market the first "Batteryless" radio: an achievement which played an important part in the rapid rise of this medium. Rogers was also noted for his success in broadcasting the first amateur transatlantic radio signal and in patenting the first alternating current radio tube. Two years later he initiated the first "Batteryless" Radio Station—CFRB Toronto, which has just celebrated its 32nd anniversary.*

In the many advances made in radio since this original achievement, Modern Metals have played an important part: developments in electronics with specialized alloys and lighter transceiver cabinets for army "walkie-talkies", for instance; both have been made possible with Modern Metals.

In the development of your own products and processes you can rely on the Modern Metals to provide heat, stress and corrosion resistance, to reduce weight and increase sales appeal with their attractive gleam.

As specialists in all the Modern Metals, backed by the resources of our suppliers, we can give you unprejudiced advice on the right alloy for your needs, with technical service and quick delivery from Warehouse stocks.

For Assistance . . . For Service — "CALL ALLOY"

ALLOY METAL SALES LIMITED

TORONTO • ONTARIO

One Source . . . Complete Responsibility . . . for all the Modern Metals

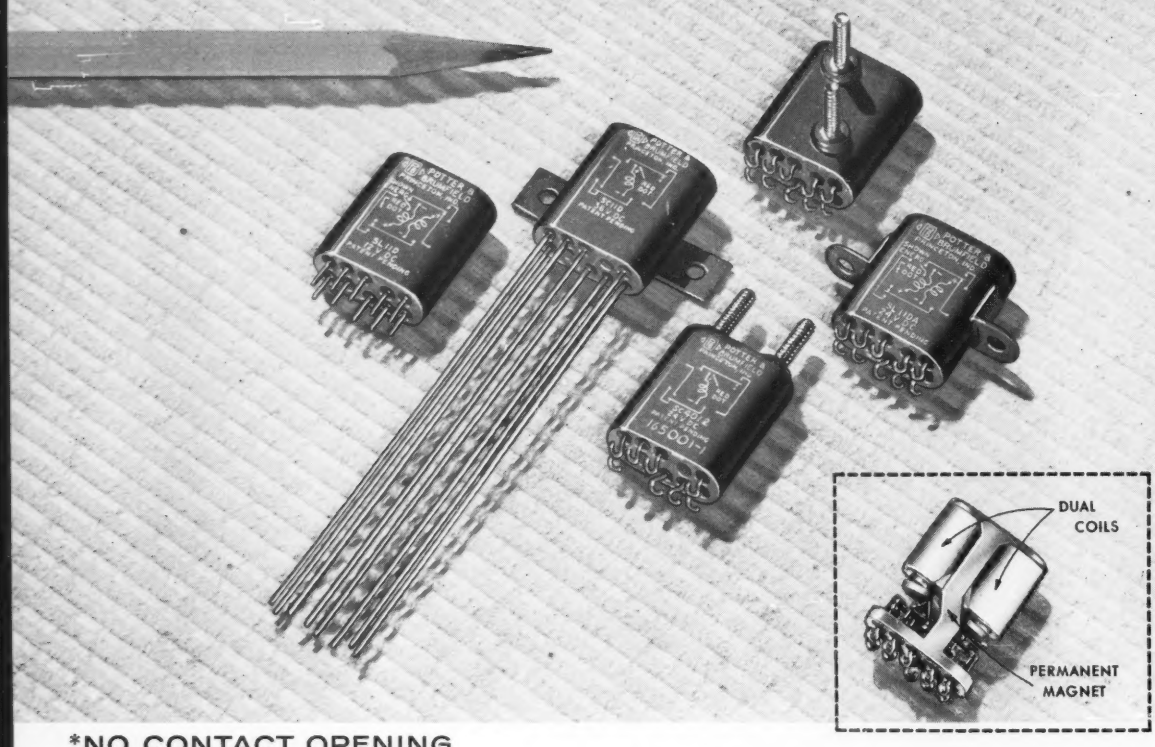
NICKEL • NICKEL ALLOYS • STAINLESS STEEL • ALUMINUM • ACCESSORY PRODUCTS

Circle number 103 on time saver card

P&B MICRO-MINIATURE RELAYS LEAD IN

performance

SHOCK: 100g* VIBRATION: 30g to 2000 cps*

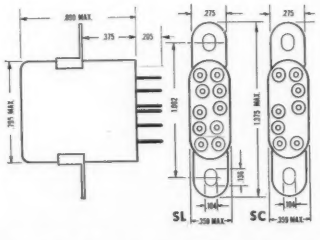


*NO CONTACT OPENING

New P&B crystal-case size relays, the SC and the SL (magnetic latching), show amazing shock and vibration capabilities. They absorb shocks of 100g and vibrations 30g to 2000 cps. without contact openings!

A highly efficient magnetic structure utilizing a permanent magnet makes possible at least twice the contact pressure found in DPDT relays of comparable size. One watt of power for three milliseconds operates either relay. Transfer time is unusually fast —0.5 milliseconds maximum.

For more information, contact your P&B sales engineer, or write Potter & Brumfield, Princeton, Indiana.



SL—dual coil latching relay. Operates on a 1 watt, 3 ms. pulse at nominal voltage. Permanent magnet latch locks the armature in either position.

SC—non-latching relay with series-connected dual coils. Operates on approximately 1 watt at nominal voltage. Coils must remain energized to hold the armature in the operate position.

SC and SL Series Engineering Data

GENERAL:
Insulation Resistance: 10,000 megohms, min.
Breakdown Voltage: 1,000 V. RMS.
Shock: 100g.
Vibration: 30g 55 to 2000 cps.; 0.195″ max. excursions from 10-55 cps.
Temperature Range: —65° C. to + 125° C.
Weight: 15 grams without mounting bracket.
Operate Time: 3 MS. max. with 550 ohm coil @ 24 V. DC. (SL: 630 ohm coil at 24 V. DC).
Transfer Time: 0.5 MS max.
Terminals: (1) Plug-in for microminiature receptacle of printed circuit board.
(2) Hook end solder for 2 #24 AWG wires.
(3) 3″ flexible leads.
Enclosure: Hermetically sealed.

CONTACTS:
Arrangement: 2 Form C.
Material: Optional
Load: 2 amps. @ 28 V. DC, resistive; 1 amp @ 115 V. 60 cycles AC, resistive.
Pressure: SC—16 grams min.; SL—20 grams min.

COIL:
Power: Approx. 1.0 watt at Nominal Voltage.
Resistance: SL—40 to 10,000 ohms; SC—35 to 20,000 ohms.
Duty: Continuous.

MOUNTINGS:
Bracket, stud and plug-in.

P&B STANDARD RELAYS ARE AVAILABLE AT YOUR LOCAL ELECTRONIC PARTS DISTRIBUTOR

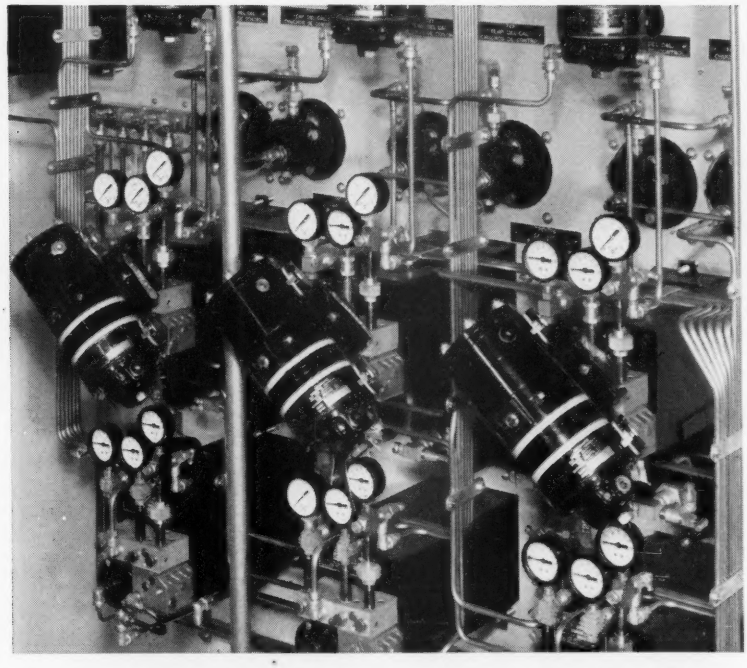
POTTER & BRUMFIELD CANADA LTD.

GUELPH, ONTARIO

Circle number 142 on time saver card

IMPERIAL Engineering and Data File

ENGINEERED TUBE FITTINGS — VALVES — TUBING TOOLS



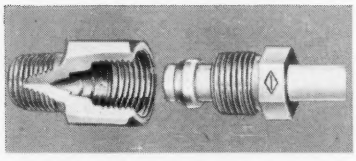
Leakproof connections quickly made with Hi-Duty tube fittings on Panellit control boards

Tube fittings that assemble to tubing fast and provide assurance against leaks are one of the top requirements for control boards.

That's why Panellit selected Imperial Hi-Duty fittings on this panel board used for automatically controling a variety of oil refinery processes.

Hi-Duty Fittings have a one-piece nut and sleeve. A joint is made simply by pushing tube into fitting and tightening nut. Sleeve shears off and becomes permanently attached to tube. One man can easily assemble up to four Hi-Duty fittings in the time it takes to assemble one flare fitting. Hi-Duty assembles one-third faster than compression fittings and can be disconnected and reconnected repeatedly without leakage. And they withstand five times as much vibration as compression or flare fittings.

Write for Bulletin No. 3002



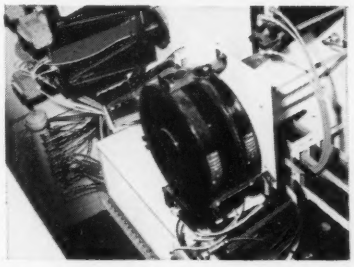
Disassembled Hi-Duty Fitting shows how sleeve has become permanently attached to tube.

HOW HI-DUTY SAVES 36% TO 72% ON INSTALLATION TIME!

TYPE OF FITTING	AVERAGE TIME FOR EACH JOINT	JOINTS PER HOUR
HI-DUTY	11.7 sec.	307
Regular compression	18.5 sec.	194
Flare	48.2 sec.	74

These studies were made under actual shop conditions.

Poly-Flo fittings on color-coded tubing simplify servicing



International Paper Company service engineers enjoy simplified checking of 14-foot graphic control panels containing automatic and manual controls for operation of a complete pulp bleaching plant.

Polyethylene instrument loops are color-coded according to products. Nine tubing colors are available conforming to I.S.A. standards. Tube connections are made with Imperial Poly-Flo fittings.

In the event servicing is necessary, the engineer speedily disconnects and reconnects Poly-Flo fittings. No wrench needed . . . fittings need only to be finger tightened and joints stay tight.

Write for Bulletin No. 3025

Free handbook tells how to work with tubing

This practical book tells you how to cut, flare, bend, swage, ream and solder tubing . . . fully describes modern tube-working practice.

Handbook No. 369

CONTACT YOUR INDUSTRIAL DISTRIBUTOR OR WRITE TO:

IMPERIAL BRASS MFG. CO.
Dept. DE-49, 18 Hook Ave.,
Toronto, Ontario

Please rush me:
Bulletins ☐ No. 3002 ☐ No. 3025
☐ No. 369

Name .....
Title .....
Company .....
Street .....
City ..... Zone..... Prov. .....

IMPERIAL

THE IMPERIAL BRASS MFG. CO.
18 Hook Ave., Toronto, Ontario

Circle number 131 on time saver card

Steam Requirements SLASHED 90% with Cold Bonderite System

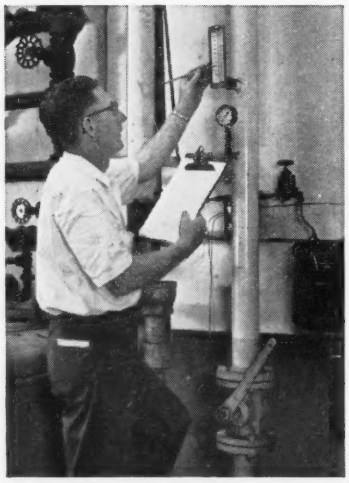
50,000 lbs. of steam per hour *before*, 5,000 lbs. per hour *after* installation of Cold Bonderite System!

That's one of many amazing records being made in plants all over the country by this new Parker Rust Proof system.

The switch to Cold Bonderite requires no new equipment, no changes in layout, no new techniques to teach your crew. The specially formulated cleaner and Bonderite simply operate at greatly reduced temperatures, cutting heat requirements by 50 to 90%.

Results? Coatings of traditional Bonderite quality and uniformity with big heat and operating savings.

Nearly a hundred plants, in many industries, are cashing in on Cold Bonderite right now. Get this competitive advantage for *your* plant, too. Call in the Parker man in your territory and begin saving money now!



Temperature gauges tell the story. Special Parco Cleaners and Bonderites in Cold Bonderite System operate 40° to 75° cooler!

Since 1914— leader in the field

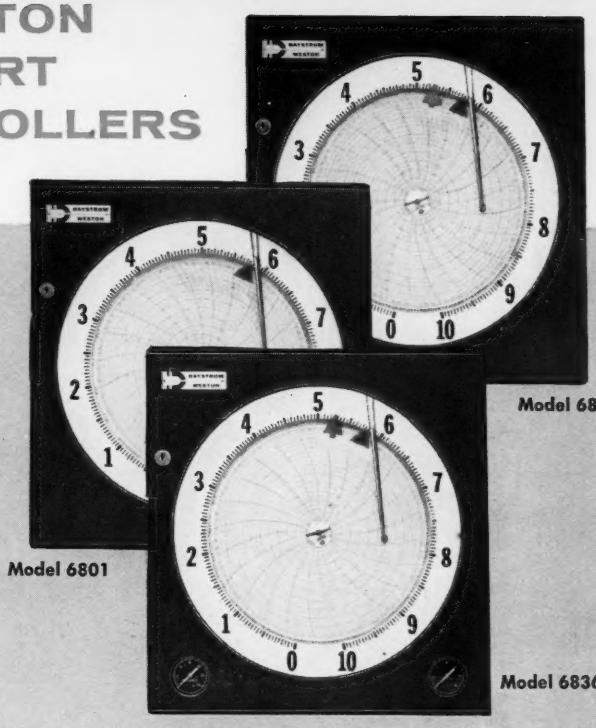
PARKER RUST PROOF COMPANY OF CANADA LTD.
Rexdale Blvd., Rexdale (Toronto) Ontario

BONDERITE	BONDERITE and BONDERLUBE	PARCO COMPOUND	PARCO LUBRITE	TROPICAL
corrosion resistant paint base	aids in cold forming of metals	rust resistant	wear resistant for friction surfaces	heavy duty maintenance paints since 1883

*Bonderite, Bonderlube, Parco, Parco Lubrite—Reg. U.S. Pat. Off.

Circle number 140 on time saver card

DAYSTROM-WESTON CIRCULAR-CHART RECORDERS CONTROLLERS



there's unequalled value in this newly designed series...

thanks to UNITIZATION*

All the features of the famous Weston strip-chart instruments are available in this new line of potentiometer and Wheatstone Bridge recorders and recorder-controllers. And there's a bonus in readability and easy maintenance. The basic recorder designs (Models 6801 & 6821) show their versatility in adapting to either pneumatic (6836 & 6856) or electric (6833 & 6853) control—of the 2-position, proportioning, or differential-gap varieties.

Here are some of the other dividends *unitization* brings you in this great new series:

EASIEST MAINTENANCE . . . revolutionary D-Pak Constant Voltage Supply Units eliminate batteries, standard cells and standardizing mechanisms in potentiometers. Wheatstone Bridges are equipped with Battery Eliminators. Every component is easily accessible; there's no jungle of wires to hamper inspection and servicing.

READABILITY . . . 12-inch charts, with full-scale pen travel of 4⅝ inches. 320° concentric indicating scales are 33⅞ inches long. Universal mounting permits use in the most advantageous locations.

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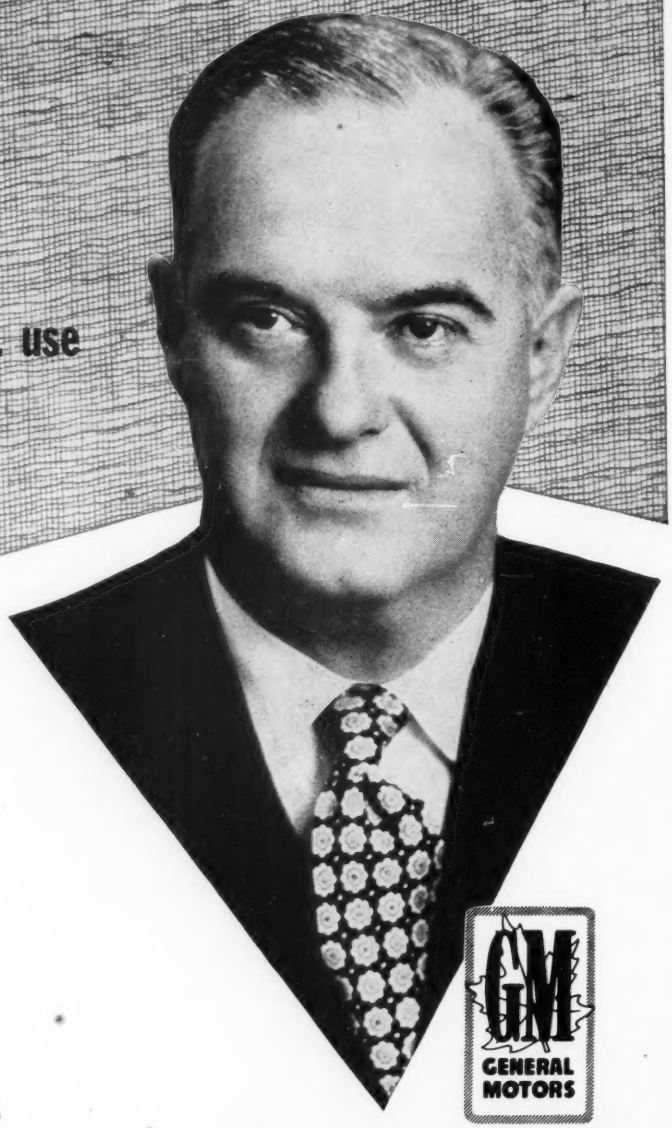

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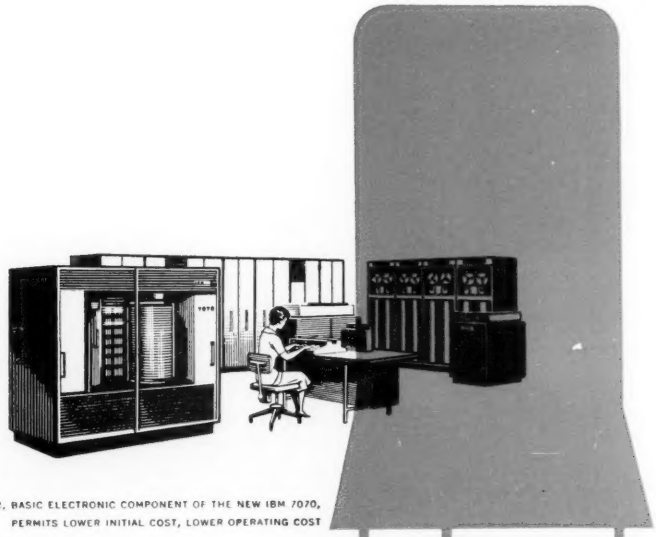

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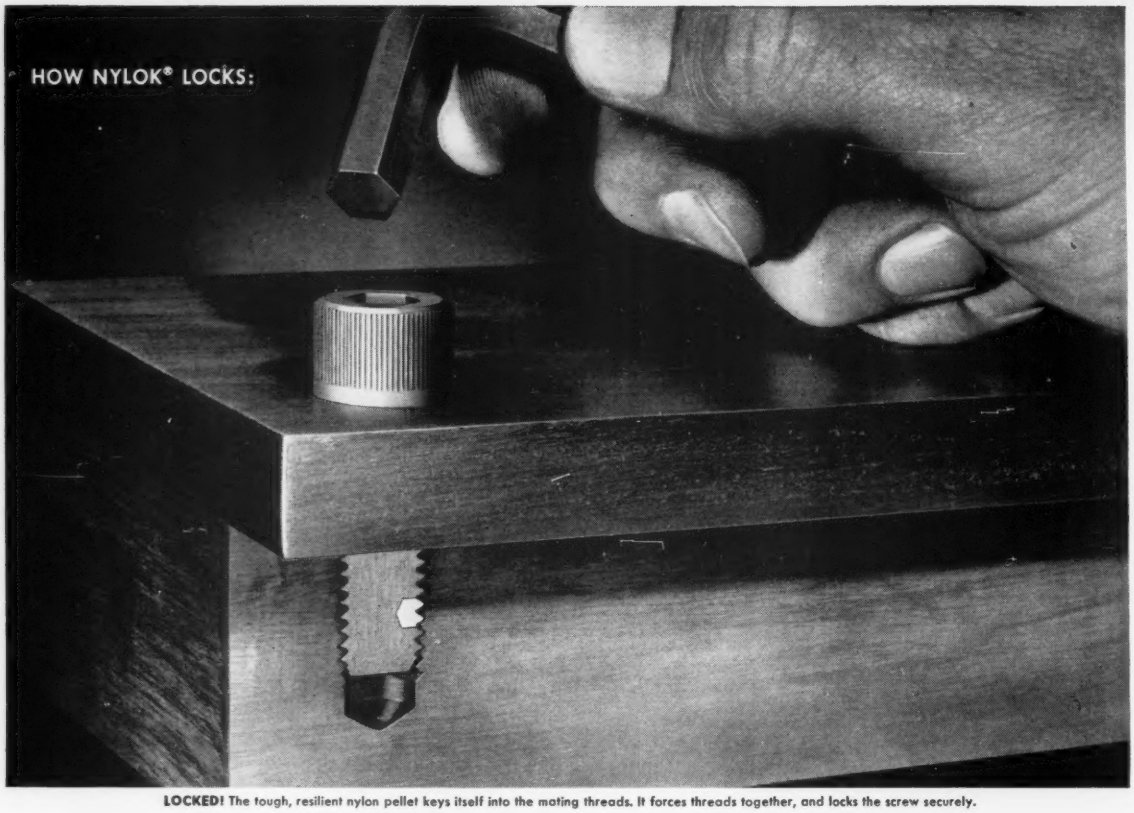

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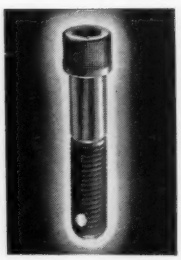
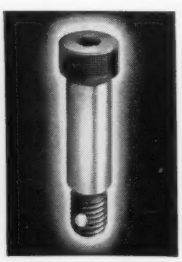


Socket head cap screws. Standard sizes #0 to 1 in.



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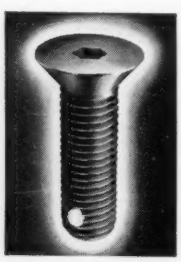
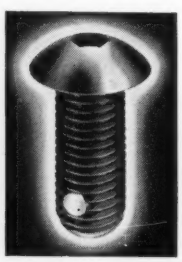
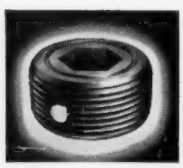


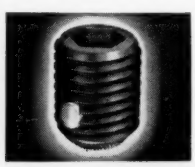
Flat head socket screws. Standard sizes #4 to ¾ in.



Button head socket screws. #4 to ⅝ in.



Socket pressure plugs. Standard sizes $\frac{1}{16}$ to 1¼ in.



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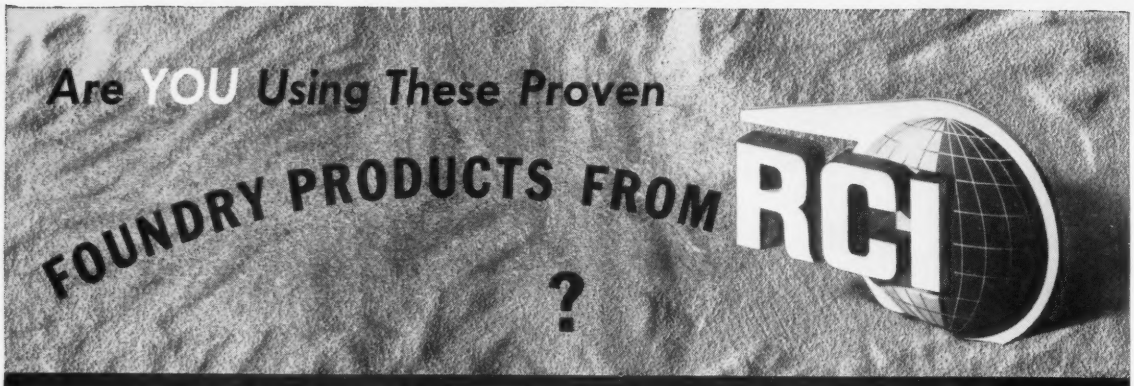

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FOUNDREZ 7150,7151	Liquid Resin	SHELL MOLDS AND CORES (Dry Sand, Resin)	Unusual Stability
FOUNDREZ 7500,7504,7506,7555	Powdered Resin		Self-Activation
FOUNDREZ 7520	Granulated Resin		High Tensile Strength
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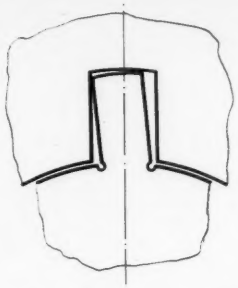


Fig 1 (a) Line contact

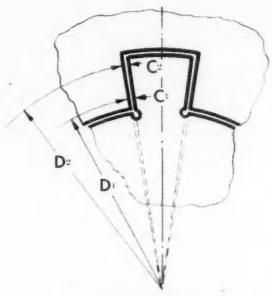


Fig 1 (b) Impractical design

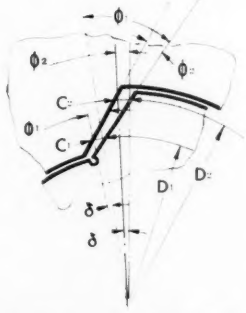


Fig 2 (a) Serration spline

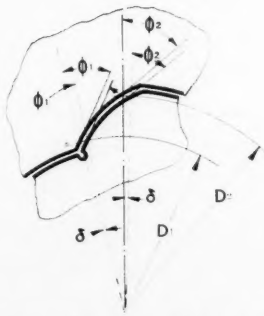


Fig 2 (b) Involute spline

Design Engineering

Involute splines

For the greatest amount of contact along tooth profiles irrespective of the backlash

Some of the advantages of the new SAE standard for involute splines from a design standpoint were discussed by Leon N. De Vos at recent SAE meeting.

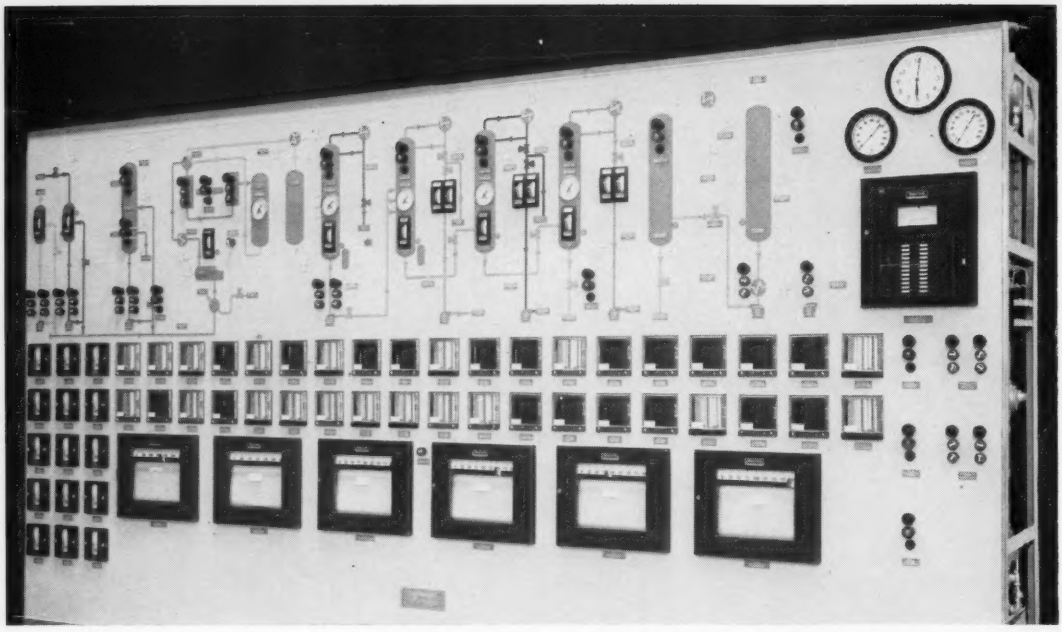
This type of spline provides the greatest amount of contact along the tooth profiles, regardless of the amount of backlash in the splined connection. This backlash or clearance is usually necessary for assembly.

Fig 1(a) shows that straight-sided splines (where the sides of the shaft tooth are parallel to the centre line) have only line contact on the side of the tooth when clearance is provided between the mating parts. The tip of the tooth on the shaft reaches the side of the internal spline before any other point of the tooth side is contacted.

Fig 1(b) indicates how the problem can be overcome by making the amount of clearance proportional to the distance from the centre. The clearances C_1 and C_2 are proportional to the Diameters D_1 and D_2. Such splines (with tooth sides that fall on the radius) are by no means a solution of the problem, because of the weak cross-section of the shaft tooth at its root and the impractical shape of the internal spline.

Fig 2(a) shows how this condition may be corrected with straight-sided serrations. The clearances C_1 and C_2 (subtending the same angle δ) are in proportion to the diameters D_1 and D_2 at which they are measured. When the spline tooth rotates under load against the side of the female spline, it matches along its whole active depth. Consequently, after it is rotated back into the position of fig 2(a), the angles ϕ_1 and ϕ_2 (which represent the angles between the profiles and radial lines through the intersections of these profiles with a reference diameter) are equal on the internal and the external spline tooth. These angles are commonly called the pressure angle. Thus, **the requirement of surface contact demands equal pressure angles at the same reference diameter for both splines.** The application of this principle to the general case of splined teeth with curved (involute) sides is shown in fig 2(b). The pressure angles ϕ_1 and ϕ_2 are the same on both mating spline profiles.

The design shown in figs 2(a) and (b) provides maximum tooth contact, with an increased minor diameter and a wide-base tooth, and consequently there is much greater shaft and spline tooth strength. ★



Photograph shows an actual panel before shipment to an amine plant. Compare this with last photo in this article.

Developing panel layouts the pin-up way

This article may help you do a better design job — and save time, money

A. James Waldron

Here is a 6-step, pin-up panel (PUP) layout method that lets you see exactly what your design would look like to scale in full color before it is built, and produces color photos quicker than you can make finished drawings.

The total initial equipment cost for a panel, pins, tape, paper, was less than $75 and is a non-recurring expenditure. Each panel construction thereafter costs less than $10 for expendable material, such as tapes and pins.

PUP is a versatile tool, not only for the instrument engineer, but for other engineers as well. Some of the other phases of engineering with which it can be used are given in this article.

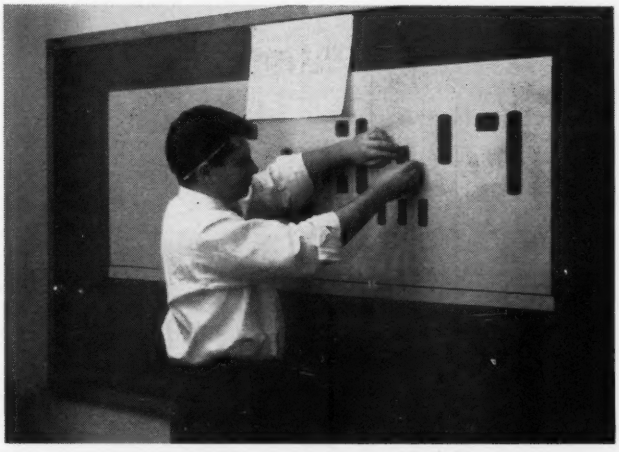
In seeking ways to increase the efficiency of our engineering procedures, the Instrument Division of this company turned its attention to the method of control-board drawings. We knew of the advantages of scale models in simplifying plant design, and decided to try a similar technique for developing panel layouts. With some experimentation, we achieved a novel photographic method for rapidly constructing impressive control-board layouts. All kinds of panel boards (conventional, semi-graphic, graphic or combinations thereof) are readily made.

Size & equipment. In the initial experimental stage, a 4 to 1 reduction from actual size was decided on as the optimum. The mock-up panel gives the same visual perception at 4 ft, as the operator gets 12 ft from the actual panel. Photographs of all instruments, pushbuttons, switches and so on (from a front view at this 4 to 1 reduction from actual size) were requested from instrument manufacturers. The response exceeded expectations. Within 4 months we had a complete library of scale photographs of the panel-mounted instruments from all the manufacturers solicited.

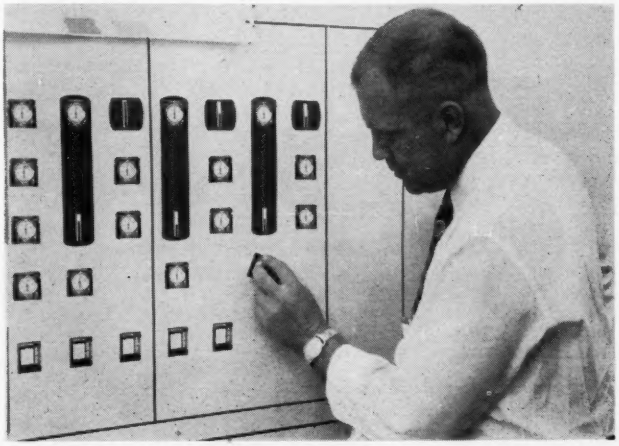
4 x 8 ft fibre-board panels are used as a mounting board. Having more than one, allows us to construct extra long panel boards, or boards on more than one concurrent contract. They are portable, allowing transfer to various offices (due to job location) and to photographic studios, as time scheduling and lighting requirements dictate.

Originally, we used glossy photo prints made from these reduced negatives, but they caused glare during

1 *Working from engineering diagrams and instrumentation specifications, the instrument engineer first creates by free-hand sketch, the proposed panelboard layout. Cross-ruled paper is a great help here.*



2 *Next, the free-hand layout is constructed as a 4-to-1 scale pin-up. Poster cards in either grey or green (denoting sections of the control panel) are pinned on the instrument department's wallboard.*



3 *Here an instrument draftsman attaches scaled photos of instruments to the panel. These photo-reductions were obtained from instrument manufacturers and can be used over and over on other pin-up projects.*

continued ▶

photography. A better (and cheaper) method is to reproduce one print by the Zerox system on multilith master. An unlimited supply of final positive prints are dull, but definite in detail.

Symbols and color codes. Symbols for towers, accumulators, exchangers, vessels, heaters and so forth are cut to scale from colored background paper. Once made, they are catalogued and filed, for use in other control-board layouts. Flow lines are made from the wide variety (and combination) of colors and widths of "scotch tape," including alternate colors on one tape. A consistent color code is followed throughout the panel design. We use map making pins for valve symbols, point identification, running lights and so on, and thumbtacks for pump symbols and sometimes for pushbuttons.

After some experimentation we discovered that thin poster cards (with a gray or green background) are easily cut into 4, 2 and 1 ft sections. All sections are 2 ft high, representing the scale of the standard industrial panel height of 90 in. plus a scaled 6-in. curve. Obviously, a 32-ft long control panel mock-up for any fibre-board section is a maximum. Longer panel boards are continued on separate, but adjacent, mounting boards. Each tv poster card is pinned to the fibreboard as needed and is reusable. Small-headed dressmaker pins are used to pin the control board sections in place on the fibreboard panels. Symbols and instrument prints are affixed to the tv poster card with double adhesive-backed masking tape.

The completed control-board arrangement can be photographed in full color (if the panel is of the graphic type) for record purposes. A color code section showing what the various symbols represent (and the matching of line colors with services) is included. If needed, these photographs can be "blown-up" and reproduced on vellum by the "phototact" method. This will give a permanent reproducible tracing for future recording and copy purposes. Also the new microfilming technique can be easily applied for permanent and low file-space record. On long panel-board arrangements, repetitive sections are often found. Here were find that just one PUP section can be constructed and photographed. Duplicate prints are made from this section. The final arrangement has the photographs of each section (including the repetitive ones) joined in an accordian style "fan-fold" which, when opened out, gives the over-all panel arrangement.

Typical applications

Proposals: Since a graphic display of instruments on an instrument control board is an operating flow sheet, the PUP technique can be used to make process-flow diagrams. Standard symbols for vessels, reactors, exchangers and pumps are used and reused. Flow lines are made with tape. The lines are identified by small numbered discs. Together with the final photograph, a separate sheet is issued giving the line numbers and necessary process data (such as flow rates, molecular weight, operating pressure and temperatures required from material and heat balances).

Visualization of layout: Another important factor in this connection is the selection of the proper conceptual design of the control board. It is often difficult for one to visualize overcrowding of instruments on a proposed panel board, simply by studying a sketch or drawing, but the completed PUP gives you the same perspective at 4 ft that the operator would get 12 ft from the actual full size control board.

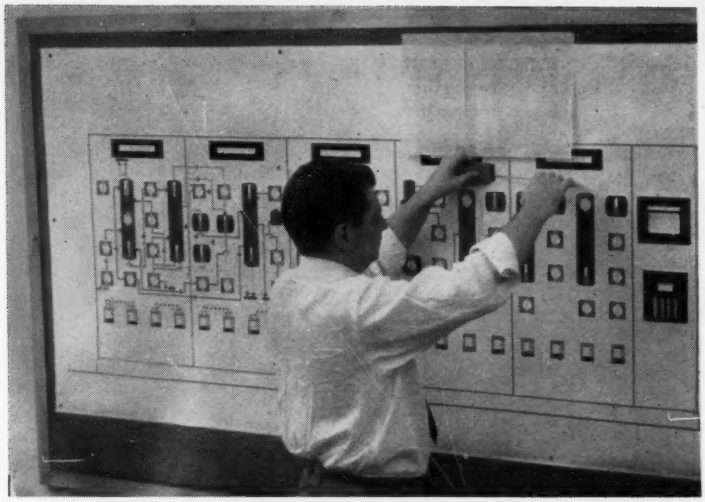
Engineering: During the actual engineering of a control board layout, the method allows you rapidly to determine the various arrangements. The client's process, operating and instrument personnel can participate with you in the developing of the desired layout. By rearranging the tape, the reusable symbols and pictures, a final layout can be agreed on in conference, photographed for record purposes and later reproduced in vellum. The cost is much less than that of reproducing a finished 30 x 40 in. tracing of a panel.

Time saved: The time taken by a draftsman or engineering assistant and a photographer to produce photographs of the finished control board layout is much less than that taken by a designer to complete a finished drawing. The initial step (that of the instrument engineer making a rough layout of the instrument panel board) is the same whether the PUP system is used or a designer lays it out on a standard tracing. However, we have found that the over-all time favors the former by at least 30% less time.

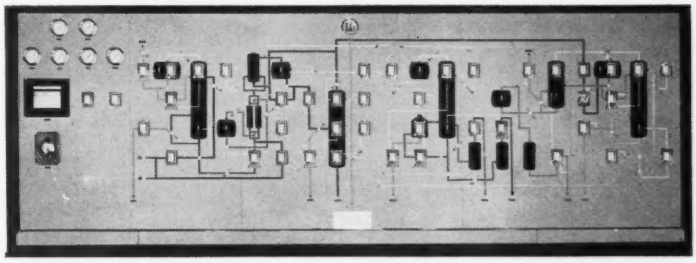
The finished photographs (together with proper specifications) are used to obtain firm bids from control board manufacturers. Here reverse prints of the sections are also made from the original negatives. These are transferred to multilith masters via the Zerox process. This gives a picture of the rear of the panel. On these multilith masters are marked (by multilith pencil) the item numbers of the particular instrument, the back of the board location of tubing, piping, wiring and ancillary devices (such as solenoid valves or pressure switches). There is an interesting point to be made here; extensive control board drawings made by a consulting engineer or user are redundant. The manufacturer will use his own techniques to make an arrangement drawing and from this make his shop drawings with cut-outs and construction details. This service must be paid for by the purchaser, since the manufacturer's engineering costs are buried in his price. Any method that minimizes or eliminates control board drawings by the engineer is a direct saving to the engineer and his client. Final control board drawings made by the vendor will satisfy any contractual or legal requirements and serve as completion record prints. Another good use for the PUP procedure (particularly with a graphic control board) is for work designation and distribution to the various craft unions before construction.

Variations: There are several variations of the PUP method. One is the use of backing paper, a heavy green paper 36 in. wide that comes in rolls. The symbols and instruments are pasted permanently to this background. This takes more time (and it is less flexible) but it has the advantage of one large-scale permanent control board arrangement. Photographs are necessary if more than one copy is required. Another variation uses a steel partition or wall (such as a movable office partition) as the background. Symbols and instruments are held in position by small magnets, and tape is used for control board section delineation and also for the process lines. This method is probably faster than the pin-up panel, but photographs are required for record prints, and lighting advantages are limited in that the photograph must be taken "in situ" rather than by moving a portable fibreboard panel to a studio.

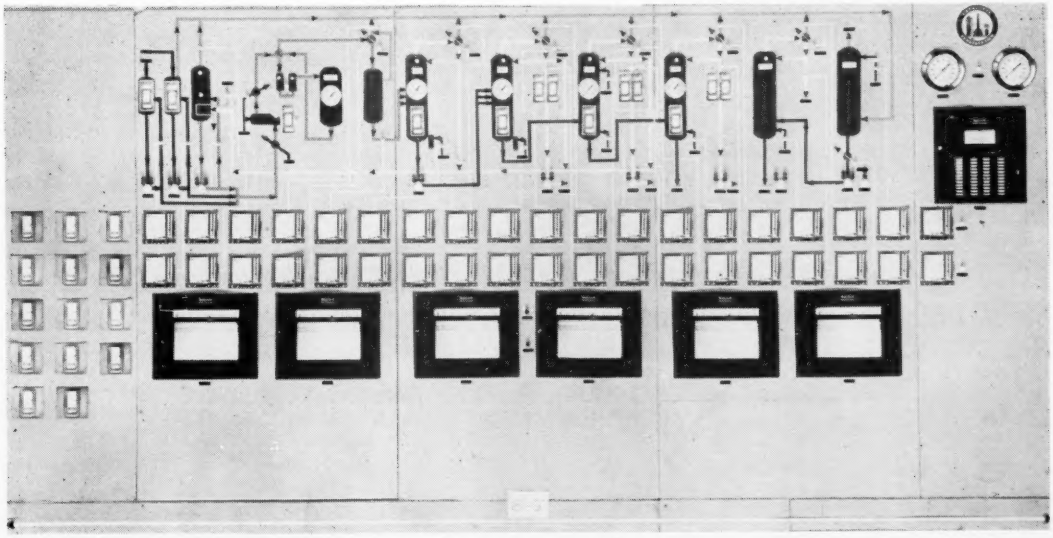
Information and photographs from Catalytic Construction Co. where Mr. Waldron is a division engineer.



4 *In step 4, color-coded flow lines are located on the pin-up, using ⅛-in.-wide colored adhesive tape. Colored map pins represent valves and pilot lights: colored thumb tacks dub as pump symbols, play the part well.*



5 *This is the end of the pin-up road. Photo above shows the completed panel — it can be taken in black and white or full color. Time taken to produce pin-up was less than that to make a finished drawing.*



Pin-up version of amine plant panel. Top left section was left for future expansion. Design time—50 manhours.

Special-duty hydraulic valve systems

A valve that closes off (or isolates) a line is generally conveniently referred to as a hydraulic fuse. Such fuses isolate a line under these conditions:—

(1) When the flow exceeds a certain velocity.

(2) After a predetermined quantity of fluid has passed.

(3) After a certain time limit.

The fuse acts irrespective of pressure.

Michael Aumont *Design Consultant*

Introduction

Hydraulic systems are used in many engineering designs to transmit power. They are often far more suitable for the job than electrical or mechanical control systems. Many different types of valve are required, however, and much engineering ingenuity has gone into their design.

For the average design engineer, knowledge of the mechanical details and function of the less familiar (but none-the-less important) types of special-duty valve can save much time and many headaches. When faced with the special requirements of how to protect systems from excessive flow, pressure and wastage, the valves described here can either solve the problem or point the way to a better system design. Their basic design can be varied according to different specific requirements, but as outlined here they can always be relied on to do the job, with certain reservations that are mentioned.

Fig. 1 shows the basic type of hydraulic fuse. The ball is held off its seat by a spring and allows normal flow to pass. An increased flow, however, causes a pressure rise that tends to move the ball against the spring. This will eventually stop the flow, if the velocity of the fluid remains above normal. The action is not too certain, however; only when the flow is well above normal will the action be positive enough to ensure safety. Furthermore, premature closure may be caused by instantaneous changes in the flow.

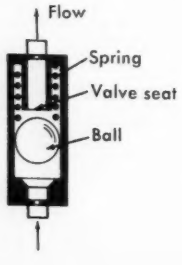


Fig. 1

A more modern equivalent of this basic type is shown in **Fig. 2,** in which the valve is unbalanced and insensitive, therefore, to back pressure.

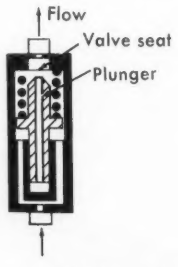


Fig. 2

A further refinement is the addition of a dashpot **(Fig. 3).** This does two things: it damps the action of the ball slightly (so that it is not too sensitive) and can also introduce a definite time-lag while the dashpot empties. The flow will not be stopped immediately, for

the lag depends on the size of the dashpot. This feature thus allows the fuse to cope with instantaneous changes of flow without stopping the flow, unless the increased velocity persists for more than a certain length of time.

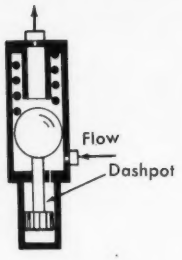


Fig. 3

The hydraulic fuse of **Fig. 4** is similar to the previous type. The restriction in the main line (and that in the orifice of the dashpot) is streamlined. This is done so that the flow is laminar through the dashpot orifice (and past the restriction of the main piston). The action of the valve is therefore made independent of the rate of flow and the viscosity; the greater the flow, the faster the dashpot empties. The valve closes after a certain amount of fluid has passed; generally, it is independent of the prevailing pressure. In practice, a light return-spring is usually used, and a small nonreturn valve sometimes incorporated in the design to help the return filling of the dashpot.

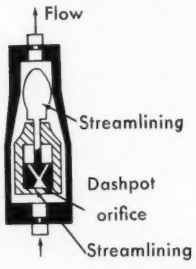


Fig. 4

The displacement type valve **(Fig. 5)** admits fluid at the top at a reasonable rate and shuts the small valve. The continued pressure then moves the piston assembly down. This displaces (from the bottom part) a volume of fluid equal to that admitted. The capacity is designed to be somewhat greater than that actually required to operate the system. Return flow takes place through the small valve, while the piston is moved back by the spring. If a break in the outlet side of the system occurs, the piston displacement becomes excessive and the small valve closes on its lower seat, thus shutting off the flow. The chief objection to this type of fuse: if a large volume of fluid is required to actuate the system, the valve will be too bulky.

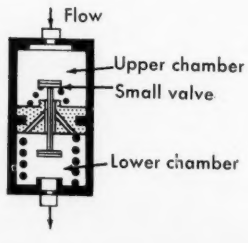


Fig. 5

Fig. 6 shows a different type of fuse, installed between the pressure supply line and the selector. The valve of the hydraulic lock (when closed) prevents fluid from reaching the jack. The small piston is therefore acted on and, by a "sample" of oil, transmits partial motion to the jack. A corresponding action of the piston of the hydraulic lock is caused, which opens the pressure valve and, in sequence, uncovers the tank return port. Normal flow can now continue, the hydraulic lock valve being open. Had the tank return line (or the pressure line) been broken, no unlocking signal would have been transmitted, and the main valve would have remained closed. Any break in the return line, while the main valve is open, will cause the valve to close promptly, by virtue of a small leakage past the lock-piston. It therefore has the desirable and satisfactory feature of being insensitive to small rates of return flow. Similarly, small leaks at the selector are compensated by a small leakage than can occur past the pressure-signal piston.

A manual opening or resetting device is provided.

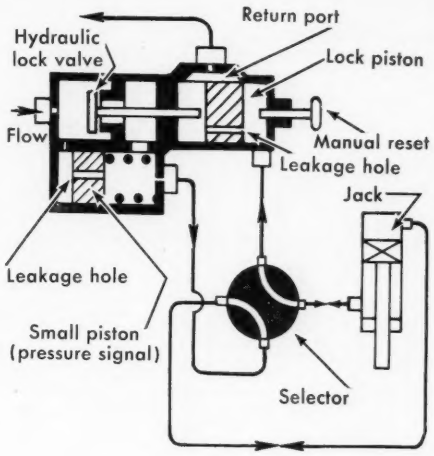


Fig. 6

Pressure cut-off valves

When it is desired to limit (or cut-off) pressure to the system, a pressure cut-off valve is useful. In such examples as automobile and trailer brakes, the cut-off may be adjusted to suit conditions. The basic design is shown in **Fig. 7.** The spring holds the valve open for normal conditions and allows free fluid-flow in either direction. As the pressure rises, however, the movable piston moves downward, because of the pressure acting on the larger area. Finally the valve closes and prevents any further rise in outlet pressure. The inlet is merely sealed all the more if the pressure is increased. Once the pressure drops to its original, safe value, the valve opens again and allows free flow.

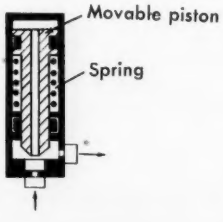


Fig. 7

continued ▶

Fig. 8 is basically the same. The only real difference is the substitution of a slide valve for a piston.

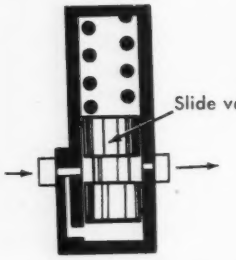


Fig. 8

Shown in **Fig. 9** is a cut-off valve operated by a diaphragm. The valve is closed by a drop in pressure at the outlet (sometimes desirable). The valve has to be reset manually by pushing a control knob. This design could lend itself to a type of hydraulic escapement design; pressure drop at outlet would be because some function had been accomplished that exhausted the pressure. As soon as this occurred, the action could be automatically repeated by arranging for the reset knob to be operated automatically at the end of the previous action, when the cycle would begin all over again.

If the connections were reversed, the operation would be similar to other isolation (or cut-off) valves: the release lever action and the small valve would require to be reversed, so that the valve closed on the inlet side.

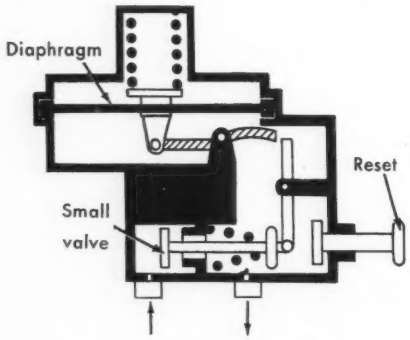


Fig. 9

Pressure maintaining valves

An example of such a valve (similar to the reverse of Fig. 9) is shown in **Fig. 10.** Pressure maintaining valves exist in several different forms, but their function is the same in all cases: to maintain a certain, predetermined pressure in part of the system, for some special purpose.

Examples of the use of these valves are:

(a) To prevent the inflation of an air bottle until another one (being inflated from the same compressor) has been filled.

(b) To maintain pressure in the part of the system before the valve (for, say, brake operation), while the system beyond the valve operates at a lower pressure.

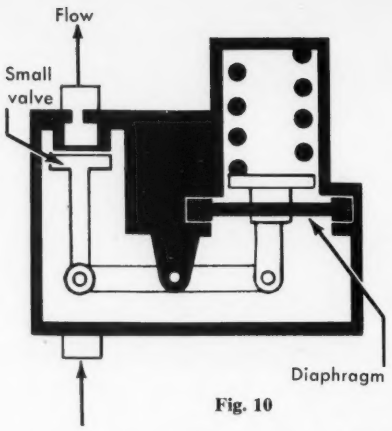


Fig. 10

The valves in **Figs. 11(a)** and **11(b)** are basic designs of pressure-maintaining valves. Actually overbalanced relief valves, they open at a pressure equal to the spring force plus any back pressure. They close when the pressure has dropped back to that equivalent to the spring force. The small valve in Fig. 11(b) allows back-flow.

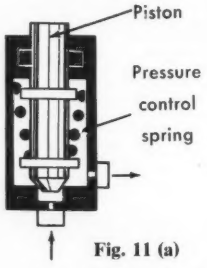


Fig. 11 (a)

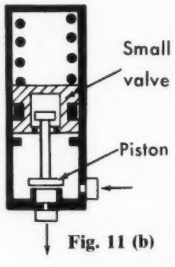


Fig. 11 (b)

One example of an interesting type of valve included here **(Fig. 12)** represents what is, strictly speaking, a selector or on-off cock. Once opened, it will close after a certain interval of time. This type of valve, for example, forms the basis of the "waste-not" water taps installed in many restaurant washrooms.

When the knob is pushed, fluid enters through the central pilot valve into the upper chamber. The pressure then unbalances the piston, which has a larger area in the upper chamber than in the lower one. The piston moves down so that the upper chamber is now flooded with fluid at a pressure equal to that of the supply line. When the knob is released, however, the fluid pressure in the top half can leak out from between the piston and the valve wall. The spring (plus the pressure that is maintained on the supply side) forces the piston up into the upper chamber. The fluid is thus displaced from the upper chamber through the outlet. Flow will not occur again until the control knob is pushed. ★

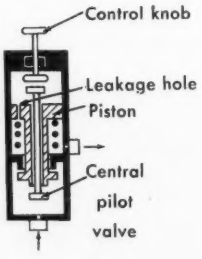


Fig. 12

A DE Show Preview

This biennial exhibition is really a four-barrelled affair. You shouldn't miss it

Eric Haworth *Assistant Editor*

The 1959 Industrial Production Show

The 1959 National Industrial Production Show of Canada will be held in Toronto, May 4th through 8th. Approximately 200,000 sq. ft. of space will be used by the more than 300 exhibitors. This is an increase of 50% over the 1957 show.

Objective of the show is to present (under one roof) an assembly of engineering equipment and production improvements, to plant executives and engineers. Since the last show was held, the N.I.P.S. has assumed international status with United States and European manufacturers augmenting the strong Canadian representation. A highlight of the show will be the group display organized by the British Board of Trade and the Birmingham Exchange and Engineering Centre.

In an interview with DE, Mr. E. M. Wilcox, show manager said: "We are very impressed with the tremendous interest the show has generated. Gains over the 1957 show are more than 50% — and we have taken over the entire Industry Building at the C.N.E., reputed to be the world's largest exposition building. We also have space in the Coliseum Annex. As a matter of fact, many 1957 exhibitors have doubled and tripled their space in this year's show."

Co-sponsoring the N.I.P.S. are four national organizations — the Ontario Division of the American Society of Mechanical Engineers, the Canadian Welding Society, the Canadian Council of Foremen's Clubs — and the Canadian Industrial Management Association. These associations are taking advantage of the N.I.P.S. to hold a "show within a show" and the A.S.M.E. for instance, will hold a general convention with a "Productivity through Engineering" theme.

The Canadian Welding Society will hold a convention and technical sessions on May 5th and 6th in the Coliseum Building. This will feature speakers from the United Kingdom, the United States and Canada. The welding show itself will have some 50 exhibits.

While not putting on a separate show themselves, Mr. Moore Betty, chairman of the show committee told DE that a "very big attendance" from the Foremen's Clubs is expected. Mr. Betty said that there are now 42 clubs throughout Canada, with a total membership of 4,500. Courses for supervisor training are available in Western and Montreal universities.

The Canadian Industrial Management Association will hold a seminar during the big show and prominent speakers will discuss subjects of timely interest to members. This society is concerned with the layout, organization and administration of industrial plants.

To sum it up, the N.I.P.S. is Canada's own show — and presents an unusual opportunity for the design engineer to view the latest in equipment and machinery as well as to talk over problems with other engineers and manufacturers. Certainly the list of exhibitors is impressive, as you will see on the following pages. When The Hon. Leslie Frost, Prime Minister of Ontario officially opens the show on May 4th — we hope you'll be there too. Meanwhile, here's a peek preview. ★

These photos were taken at the 1957 Industrial Production Show. Admission is not available to general public.

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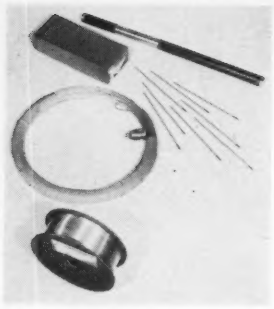

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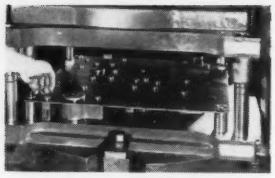

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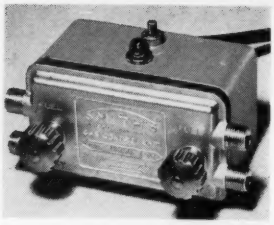

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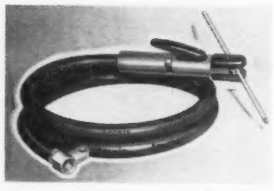

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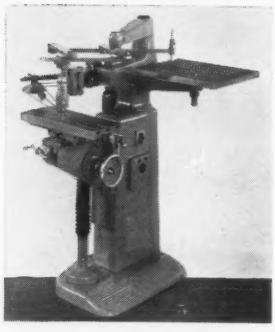

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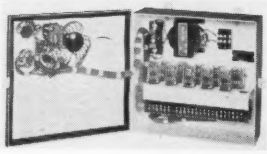

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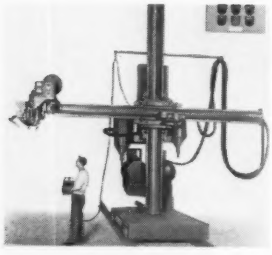

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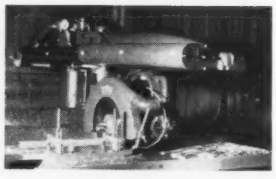

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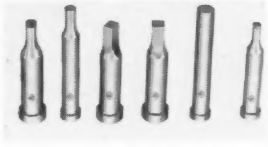

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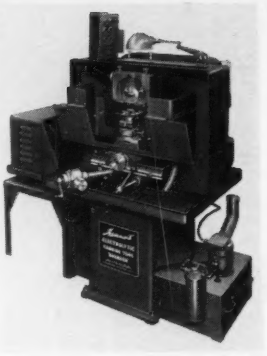
12

1. Ampco Metal Inc will display bronze welding electrodes, filler rods and wire products: examples shown. 2. Among the Arcair Co. exhibits will be this H-2 torch which has positive air control valve. 3. Big equipment. This is a Gulley Co. exhibit — Pandjiris model SWHM manipulator size 12 ft x 12 ft. 4. Some of the punches to be shown by the Porter Precision Products Co. are viewed above: they will display dies too. 5. S. B. Whistler & Sons Inc., will be displaying their range of magnetic perforating equipment. 6. Handsome engraving machine is a Kuhlmann Straube column type Gm 1/1 designed on two-dimensional principle. 7. High-speed radial arm of this cutting machine will be put to work at nonferrous metal cutting demonstrations — DeWalt Power Tools. 8. Trim display booth of the Deloro Stellite Co. will be setting for showing off several products including spray fusing welding equipment. 9. This is a gas control unit — a push-button device that regulates the flow of oxygen and fuel gas in welding and cutting operations — Smith Welding Equipment Co. 10. Part of the Fawick Canada display will be given to a press and automation control system (panel interior in photo). 11. Drive Pins Ltd. will be showing a full range of fastening system products. In photo studgun is rigged in a horizontal drill setup. 12. Nylon cylinder is 21 ft long, 3 in. thick and weighs 700 lb. You will see this on the Polypenco stand at the show. The following companies have sent us information on their participation in the NIPS — Canadian Liquid Air Co: "Welding Automation"—demonstrations of automatic gas-shielded arc welding. Jeffrey Mfg Co: chains, sprockets, crushers; this company will have a service-centre. The Lartin Corp.: an unusual automatic work clothing dispenser Change-o-matic. Hobbs Manufacturing Co: winding and tension control equipment — also first showing of some new equipment. Stone Franklin Co: a split roller bearing and a variable speed drive. Miller Electric Manufacturing: various electrical machines including Gold Star SR-400 and Sigma-5. H. J. Miller Enterprises Ltd: acid handling tanks, fume ducting among others. Sturtevant Co: electronic air cleaning equipment. Linde Co: several new welding electrodes and accessories will be featured. Standco Canada: precision threaded fasteners. Stratoflex of Canada: latest developments including a range of 2,000 psi gear pumps. DeVilbiss Canada: six booths will display a wide range of finishing systems. Daymond Co: aluminum and plastic extrusions. Multitone of Canada: personal call systems. Electrohome: induction, dielectric and plastic welding equipment.

A broad range of equipment and materials . . .

13. Designed for either floor or wall mounting, this Canadian Chromalox Co.'s new natural convection heater is particularly suited for industrial uses — is made of aluminum. 14. Aluminum Co. of Canada will be featuring displays of welding aluminum by all the important industrial fusion processes. Photo shows the setup of a typical demonstration booth. 15. Thermovolt Instruments Ltd. will be showing several of their instruments including the portable electronic temperature controller (photo), suitable for over 100 different control operations. 16. The Bede Products (Canada) Ltd., will be demonstrating their airless painting unit which is said to boost output by 30%. 17. Photo shows a Bausch & Lomb optical gauge on display with other equipment on this company's stand at the NIP Show. A bench comparator and stereomicroscope are included. 18. Wainbee Tools Ltd. will show the Tork-Mor oscillating air hydraulic motor (ilustrated) together with electric counters, variable speed transmissions. 19. Electrolytic chip breaker grinder (photo), a wet abrasive belt grinder and a flat finishing machine will be included in the exhibits of the Hammond Machinery Builders Inc. 20. Eden and Associates have an extensive display planned including the Nelson aluminum stud welding gun, NS-10. This has special positioning accessory for welding studs accurately at a 45-degree angle. 21. This Shuster thread rolling machine is a partner to the same company's wire straightening and cutting machine and will be set up in the Mettler Machine Tool booth. 22. (below) the "dip transfer process" of inert gas shielded arc welding will be included in the Air Reduction Canada Ltd. display. Outfit is fully mobile.



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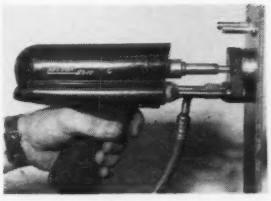

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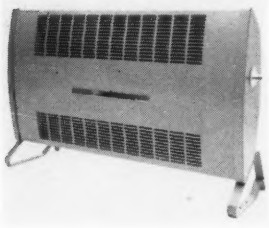

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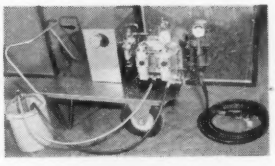

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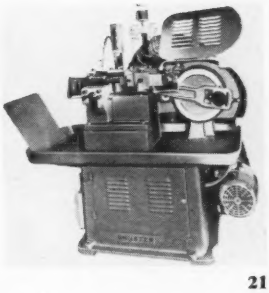

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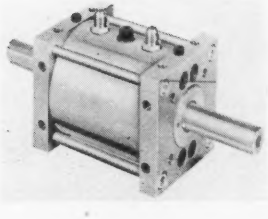

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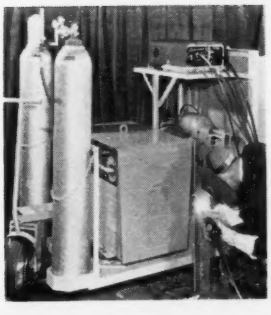

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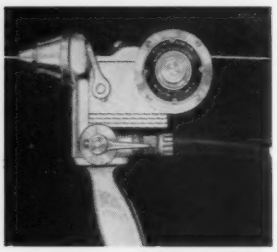

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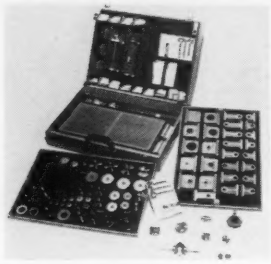

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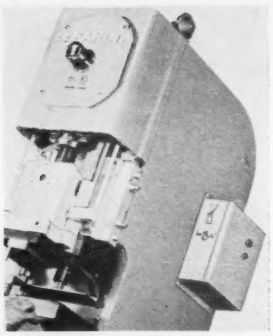

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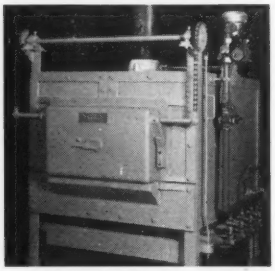

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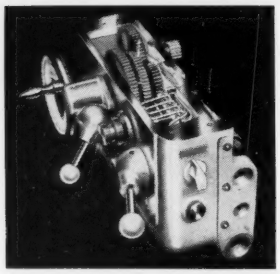

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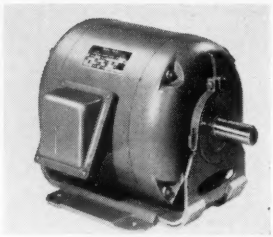
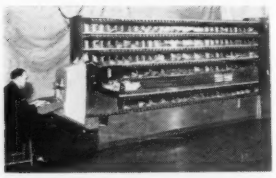


29

23. Welding and Supplies Co. will include this turbo jet metallizing gun in display. 24. Miniature precision breadboard kit (see photo)will be publicized on the Pic Design Co. booth. 25. J. S. Parkes Co. will feature "Loctite Sealant" a liquid plastic bonding agent. 26. International Machinery Co: main control enclosure of Torc-Pac press. 27. Brayshow Hynor oven furnace will be on the Samuel Osborn Ltd. stand with other equipment. 28. Part of gearing of a SAIMP lathe slated for display by the H. W. Petrie Ltd. Co. 29. Wagner Electric Co. will have complete line of 1 to 5 hp fractional and integral electric motors on view similar to above example.

Part of UK section . . .



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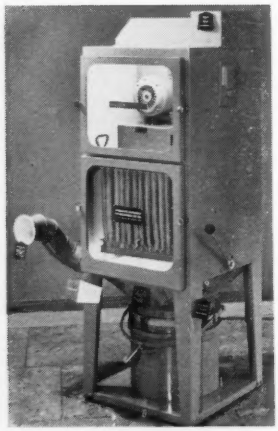

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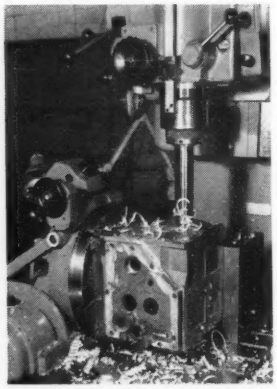

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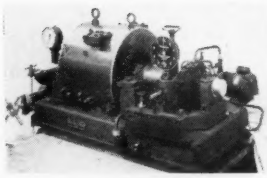

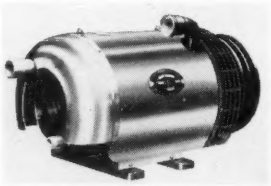

34

Altogether 37 firms will take part in the official British display. Included are: 30. Electronic letter-sorting machine of a type recently brought into operation in the U. K.: it handles 6,000 letters an hr. 31. This type of dust collector was awarded a gold medal at the Brussels World Fair last year. Unit has wide applications. 32. Makers say this jig boring and milling machine is first medium-capacity machine with automatic co-ordinate setting. 33. Steam turbine and condenser for experimental work in universities and technical colleges will be on show. 34. General design of a new range of nonlubricated rotary air pumps will make Canadian debut, at the NIPS show in Toronto.

List of 1959 N. I. P. S. exhibitors* . . .

Aero-Detroit (Canada) Limited
Aeroquip (Canada) Limited
Aget Manufacturing Company
Airetool Canada Limited
Air Reduction Canada Limited
Airwater Supplies Limited
W. A. Akhurst Machinery Company Limited
Allen-Bradley Canada Limited
Aluminum Company of Canada Limited
American Sealants Company
Ampco Metal Inc.
Associated Equipment Company
Atlantic Instrument Corp.
Automatic Timing & Controls Inc.
W. & T. Avery Canada Limited
Aviation Developments (Canada) Limited

Band-It Company
Barer Engineering & Machinery Company Limited
Bausch & Lomb Optical Company Limited
The Beacon Uniform Company Limited
Bede Products (Canada) Limited
Bellows Pneumatic Devices Limited
John Best Company
Binks Mfg. Company of Canada Limited
The Birmingham Exchange & Engineering Centre
Blackhawk Mfg. Company
G. S. Blakeslee & Company Limited
Blow Press Limited
The British Oxygen Company Limited
Brook Electric Motors of Canada
Brown Brothers Limited
Brown David (Canada) Limited
Bulldog Electric Products Co. (Canada) Limited

Canada Crane & Hoist Company
Canada Metal Company Limited
Canada Stamp & Stencil Company Limited
Canadian Chromalox Company Limited
Canadian General Electric Company
Canadian Hanson & Van Winkle
Canadian Liquid Air Company Limited
Canadian Machinery & Mfg. News
Canadian Metalworking Magazine
Canadian National Telegraph Company & Canadian Pacific Communications
Canadian Rockweld Limited
Canadian Welder
Canadian Westinghouse Company Limited
Canfast Company Limited
Colchester Machinery Corp.
Commander Mfg. Company
Commercial Marking Systems Limited
Consumers Gas Company
Cooper & Horton Limited
W. Carsen & Company Limited
Carveth Metallurgical Limited
Cosa Corp. of Canada Limited
Cowan Dynamics Limited
Frank J. Cox Sales
Central Scientific Company of Canada Limited
Clarkson Engineering (Canada) Limited
Cromac Chemical Company Limited
Curtis Wells

Davis Automatic Controls Limited
Daymond Company Limited
Daystrom Limited
Deloro Stellite
DeVilbiss (Canada) Limited
De Walt Division American Machine & Foundry Company
Dexion (Canada) Limited
Dockson Corporation
Dominion Electrohome Industries Limited
Douglas Engineering Company Limited
Dow Corning Silicones Limited
Drillmation Corporation
Drive Pins (Quebec) Limited
Dustbane Products Limited
Drycon Limited

Elder Electronics
Electric Chain Company of Canada
Electrodesign
Electrogard Equipment
Electromechanical Products
Electro-Sonic Supply Company
Electro-Vox Intercom Inc.
Embeeco Company Limited
Esab Arc Rods Limited
Eutectic Welding Alloys Company of Canada Limited
Excello Sales Associates Limited
Executone Communications Systems Limited
Extremultus Transmissions Limited

Fawick Canada Limited
Fenwal Incorporated
Fibre Metal (Canada) Limited
H. Forsberg Company
Foster, Anthony & Sons Ltd.
Foster Industrial Tools Limited

General Controls Company (Canada) Limited
General Welding & Industrial Supplies Limited
Gordon Dorckrill Limited
Griswald Engineering Limited
Gross Machinery & Supply Company
Gulley Company Limited

Hammond Machinery Builders Inc.
Handy & Harman of Canada Limited
Harco Engineering Company Inc.
Higginson Equipment Sales Limited
Hi-Lo Equipment Canada Limited
Hobbes Mfg. Company
Honeywell Controls Limited
Hughes-Owens Company Limited
H. F. Huniset Limited
Husky Mfg. & Tool Works Limited, Ontario

Imperial Brass Company, The
Imperial Oxygen Limited
Industrial Digest
The Industrial Press
Industrial Welding Supply Limited
International Business, Machine Company Limited
International Machinery Company
Irwin Walle & Company

Jena Scientific Instruments Limited
Juno Company of Canada Limited

Kee Klamps North America Limited
Kelvin Thompson Company Limited
Kent, George (Canada) Limited
Kert Mfg. Company Limited
Kimberly-Clark Corporation
Kear-Glass of Canada Limited
Klockner-Moeller Canada Limited
The Korfund Company Canada Limited
KSM of Canada Limited
Kuhlmann Straube Company Limited

Larson Company Limited, The E. V.
The Lartin Corp. Limited
Le Conseiller Commercial de France
Leeds & Northup Canada Limited
Levitt-Safety Limited
Lincoln Electric Company of Canada Limited
Lincoln Engineering Company of Canada Limited
Linde Air Products Company—Div. Union Carbide Canada Limited
Linread Canada Limited
Lisle Instrument Systems
Lufkin Rule Company of Canada Limited

MacEachern, Gordon A., Limited
Machine Production & Canadian Supply
Martonair (Canada) Limited
Matthew Moody & Sons Limited
McCraw-Hill Company of Canada Limited
Measurement Engineering Limited
Mercuria Company
Metal & Wood Fastening Devices
Mettler Machine Tool Inc.
Miller Electric Mfg. Company Inc.
H. J. Miller Enterprises Limited
Miller Fluid Power Division (Flick-Reedy Corp.)
Gilbert A. Milne & Company Limited
Minnesota Mining & Mfg. of Canada Limited
M N Automation Limited
Modenco of Canada Limited
J. B. Morrison Machinery & Company Limited
Multitone of Canada Limited

Nack Industries Company Limited
The Narda Ultrasonics Corp.
The National Cash Register Company of Canada Limited
National Torch Tip Company
Nelson Stud Welding
Norman Wade Company Limited
Nupla Mfg. Company—Div. of New Plastics Corp.

Oakite Products Inc.
Samuel Osborn (Canada) Limited
Oster Mfg. Company

Palmer Thermometer Company, The
Pathex Canada Limited
G. C. Patterson Machine Company
H. Paulin & Company Limited
F. Perkins (Canada) Limited
H. W. Petrie Limited
Pic Design Corporation
Phillips Drill Company
Philips Electronics Industries Limited
Picot Punch and Die Corp.
Plunkett Chemical Company (Canada) Limited
Pneuma-Serve Limited
Polypenco Inc.
Porter Precision Products
Prenco Progress & Engineering Corp. Limited
Process Equipment Limited
Progressive Industrial Equipment Limited
Progressive Welder Canada Limited
Prutton Corp.
Pyrotenax of Canada Limited

Qual Products Limited

Randall, Douglas (Canada) Limited
Red-D-Arc Limited
Remington Arms of Canada Limited
Rector Developments Limited
Revco Limited
Rexo-Therm of Canada Limited
The Ridge Tool Company
Robbins & Myers Company of Canada Limited
H. H. Roberts Machinery Limited

Sasco Tubes Limited
Seeley Systems of Canada Limited
Shell Oil Company of Canada Limited
S.I.D.A.M. Limited
Simcoe Mitt & Glove Company
Skiltools Limited
Skinner Electric Valve Division—The Skinner Chuck Company
Slough Estates (Canada) Limited
Smith Welding Equipment Corp.
W. R. Spence & Company
John Spotton Company Limited
Standco Canada Limited
Star Expansion Shields Limited
The Steco Corporation
Sten-C-Labl Company
Sterling Marking Products Limited
James W. Stevenson & Company Limited
Stone Franklin of Canada Limited
Stoody Company
Gilbert C. Storey Machinery Company
Stratoflex of Canada Limited
Strippit Tool & Machine Limited
B. W. Sturtevent Company of Canada Limited
Superior Propane Limited
Supreme Power Supplies
Supreme Products Corporation
Swiss Instruments Limited

Tank Linings Limited
Tecalemit (Canada) Limited
G. H. Tennant Company
Thermo Electric (Canada) Limited
Thermovolt Instruments Limited
Toledo Scale Company of Canada Limited
Torit Mfg. Company
Toronto Engine Works Limited
Tubefit Limited

Union Screen Plate Company of Canada Limited, The
United Electric X-Ray Company Limited
United Shoe Machinery Company of Canada Limited

Vac-U-Max
Van Doren Iron Works Inc.
Vibra Screw Company
Vickers-Sperry of Canada Limited
Victaulic Company of Canada Limited
Visirecord of Canada Limited
Volkswagen (Canada) Limited

Wagner Electric—Division of Sangamo Company Limited
Wainbee Tools Limited
Walkter-Turner Division Rockwell Mfg. Company
Ward Leonard of Canada Limited
Leo A. Wargin
Wayne Forge & Machine Company Limited
Weatherley Machine Company
Webster & Sons Limited
Welding & Supplies Company Limited
F. H. Welding Machines Limited
W. F. Wells & Sons
R. D. Werner Company (Canada) Limited
Westeel Products Limited
Wheatley Mfg. Ltd.
S. B. Whistler & Sons Inc.
Geo. T. White Company Limited
Wilerson Corporation
A. R. Williams Machy. Company Limited
Wilmod Machinery Company Limited
R. H. Windsor of Canada Limited
Winsmith Inc.

Accurate at time of going to press.

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The co-sponsor programmes . . .

The Canadian Welding Society

May 5—Room A—Session Chairman Mr. Harold Howard, Welding Instructor, Ryerson Institute,

(1) 9.15 a.m.—"Weldor Training at Ontario Hydro" by Mr. J. L. Alexander, Mechanical Maintenance Engineer.

(2) 10.15 a.m.—"Productivity through Co-Operative Process Development" by Mr. E. F. Davis, Consultant, Westinghouse Electric Corp. Ltd., Pittsburgh.

(3) 11.15 a.m.—"Preparation and Application of a Welding Shop Standard" by Mr. A. V. Phillips, vice-president, Sparling Tank Manufacturing Company.

May 5—Room B—Session Chairman Mr. Harry Thomasson, Consulting Engineer, Canadian Westinghouse Company.

(1) 9.15 a.m.—"Welding in Nuclear Reactors" by J. Stephenson, Liaison Officer of the United Kingdom Atomic Energy Authority.

(2) 10.15 a.m.—"New Developments in Automatic Flame Cutting" by Mr. W. H. Pearse, Mgr. Edmonton Works, British Oxygen Company, London, England.

(3) 11.15 a.m.—"Applications of Automatic Welding in Canada" by Mr. J. B. McClelland, Technical Services, Canadian Liquid Air Co., Montreal.

May 6—Room A—Session Chairman Prof. J. R. Scott, Ontario Agricultural College, Guelph, Ontario.

(1) 9.15 a.m.—"Welding Automation" by Mr. W. Larsen, Welding Engineer, Sciaky Bros. Ltd., Chicago.

(2) 10.15 a.m.—"Processes, Automatic vs Manual" by Mr. G. F. Barrett, Superintendent, Dominion Bridge Company, Lachine, Que.

(3) 11.15 a.m.—"Carbon Dioxide Welding" by Mr. D. F. Ritchie, Assistant Editor, Metals Progress, Cleveland, Ohio.

May 6—Room B—Session Chairman Dr. Ken Winterton, Department of Mines and Technical Surveys, Ottawa.

(1) 9.15 a.m.—"High Temperature Furnace Brazing" by Mr. R. E. Pritchard, formerly of Orenda Engines.

(2) 10.15 a.m.—"Stainless Steel Overlay Welding" by C. A. Sebistianowich, Dominion Engineering Works, Lachine, Quebec.

(3) 11.15 a.m.—"Automatic Welding in the U. K." by Mr. D. B. Tait, Mgr. Welding Applications Dept., Quasi Air Co., England.

The Welding Society Convention will also feature an Educational Welded Products Exhibit organized by the Society and a President's Banquet at the Royal York Hotel Roof Garden on May 6. Mr. H. George De Young, president of Atlas Steels Limited, Welland, will address the President's Banquet.

The Canadian Industrial Management Association

A Seminar will be conducted on May 4, 1959 from 2.30 to 5.00 p.m. by Professor Marvin J. Barloon. The Seminar will be a group presentation and study session and will offer practical guidance for the continuing problems of replacing outmoded machines, selection of the right machines to purchase and the economical justification of capital costs involved. Professor Barloon will explain how all related factors should be dealt with to ensure that sound capital investments are reached. A job shop replacement problem group exercise, under the direction of Professor Barloon, where the M.A.P.I. formula is applied, will be programmed step by step, covering the various items for which consideration should be given.

This Seminar will be of invaluable assistance to anyone who has responsibility of cost control in his company and is interested in reducing costs. It is designed, not only for the needs of the top executives and plant managers, but also for industrial engineering managers, production managers, engineers, controllers, office managers and cost control personnel, etc.

Professor Marvin J. Barloon is Professor of Economics at Western Reserve University and was previously a member of the faculty of the Graduate School of Business Administration, Harvard University, and of the College of Commerce at Tulane University in New Orleans.

The American Society of Mechanical Engineers Ontario Section

WEDNESDAY—May 6, 1959

1.15 p.m. Joint ASME-CWS panel
"AUTOMATION AND WELDING"
A.S.M.E. Moderator
3 C.W.S speakers
1 A.S.M.E. speaker

An extra session will be a joint ASME-Canadian Welding Society panel discussion on the subject—

"AUTOMATION AND WELDING"

This session will be held at 1.15 p.m. on Wednesday May 6. It will include three C.W.S. speakers, one A.S.M.E. speaker and will have an A.S.M.E. moderator.

THURSDAY—May 7

Morning sessions—"INDUSTRIES"

10.00 a.m. Rubber and Plastics
no speaker assigned

11.15 a.m. Metals Engineering
no speaker assigned

Afternoon sessions—"EQUIPMENT"

2.00 p.m. Instruments and Regulators
R. S. Medlock B.Sc., A.R.I.C., A.M.I.Mech.E.
Technical Director, George Kent Ltd., Luton, Bedfordshire, England

3.15 p.m. Hydraulics and Pneumatics
no speaker assigned

FRIDAY—May 8

Morning sessions—"TECHNIQUES"

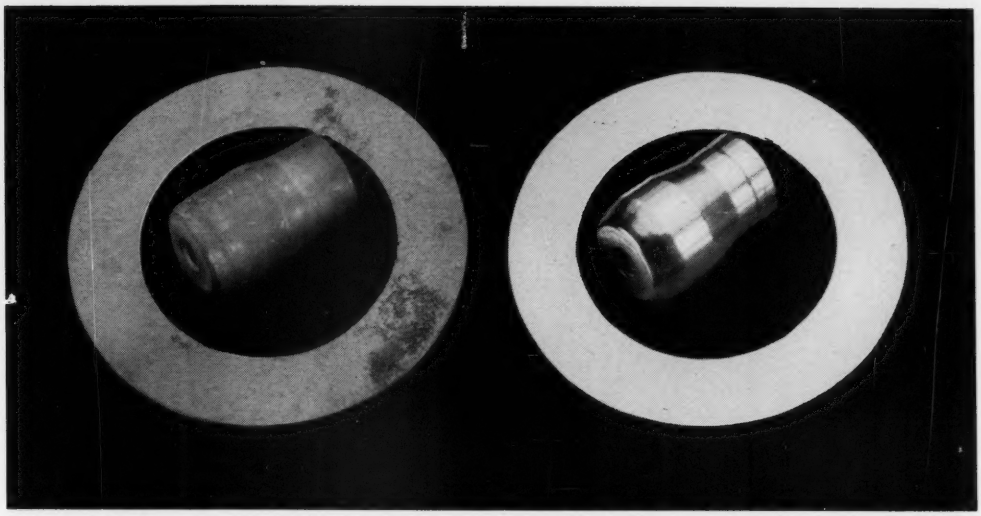
10.00 a.m. Machine Design
C. A. Sparkes, M.I.Mech.E., Director H. W. Kearns & Co. Ltd., Altrincham, Cheshire, England.

11.15 a.m. Materials Handling
no speaker assigned

Afternoon sessions—"MANAGEMENT"

2.00 p.m. Production Engineering
no speaker assigned

3.15 p.m. Management and Engineering
no speaker assigned



Before and after views of hardened valve rings and mandrels. Rings are descaled, radiused, finished

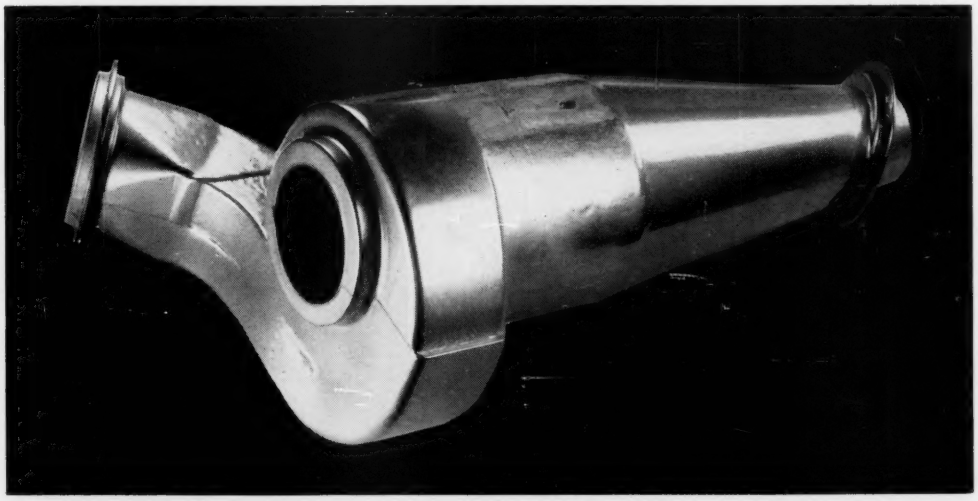
A new method of precision finishing

With three-way vibratory action, speed and control are assured

Examples are shown here of parts finished with the Lorco Vibrator (Lord Chemical Corp.). Vibrators work from 10 to 100 times as fast as tumbling barrels, with much better results. The speed and control are possible because of the 3-way vibratory action; amplitude and frequency of vibration can be varied to suit a wide range of requirements. These vibrators are available with tilting bowls for discharge or designed for complete automation.

Parts of carbon steel, stainless steel, copper alloys, aluminum, magnesium, zinc die-castings, very hard alloys, plastics and wood have all been successfully processed. Large and complex parts, or extremely small parts, can be handled just as easily.

Note the high degree of interior finish achieved in this cast aluminum dust collector component



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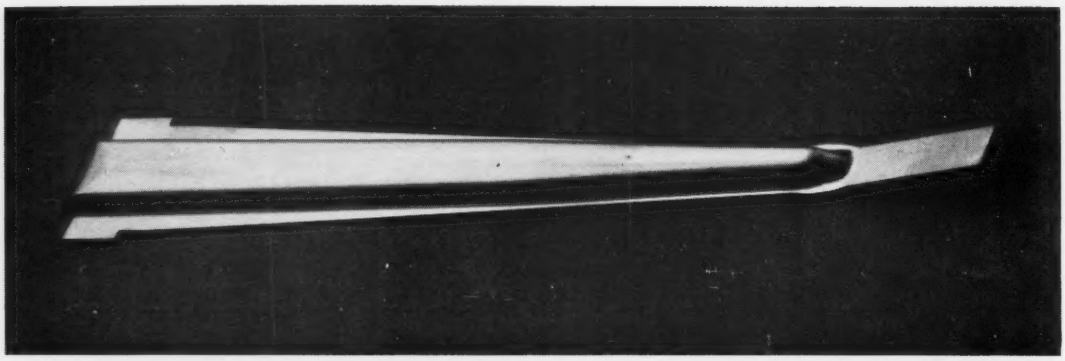
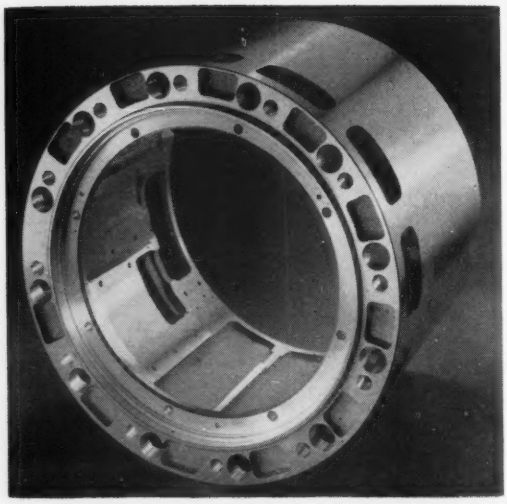
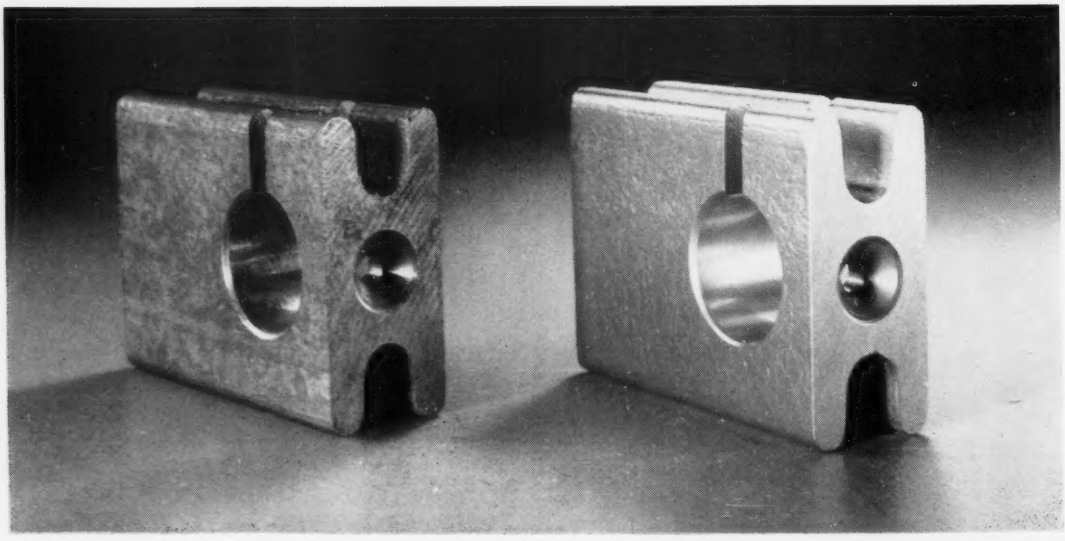


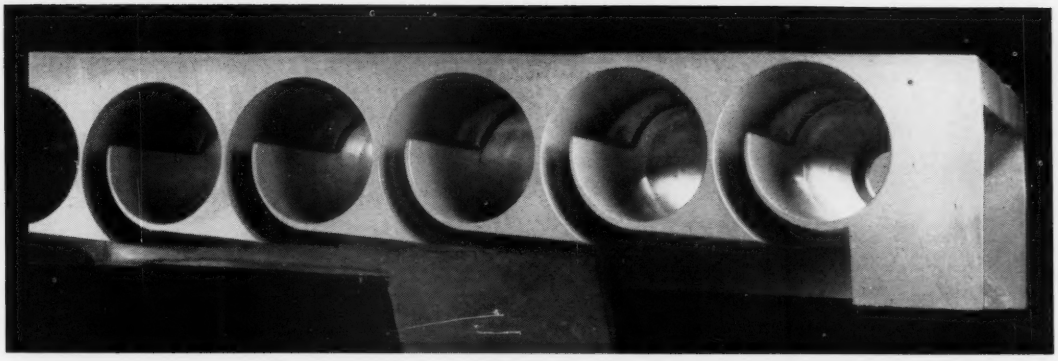


Showing wide range and types of products finished in Lorco Vibrators, is this stainless steel windshield wiper part.

Many shield areas are involved in the plating of this aluminum stator frame. Time cycle for the operation: 20 minutes.

Before and after views of carbon steel auto steering assembly parts which are deburred and finished in the vibrator.

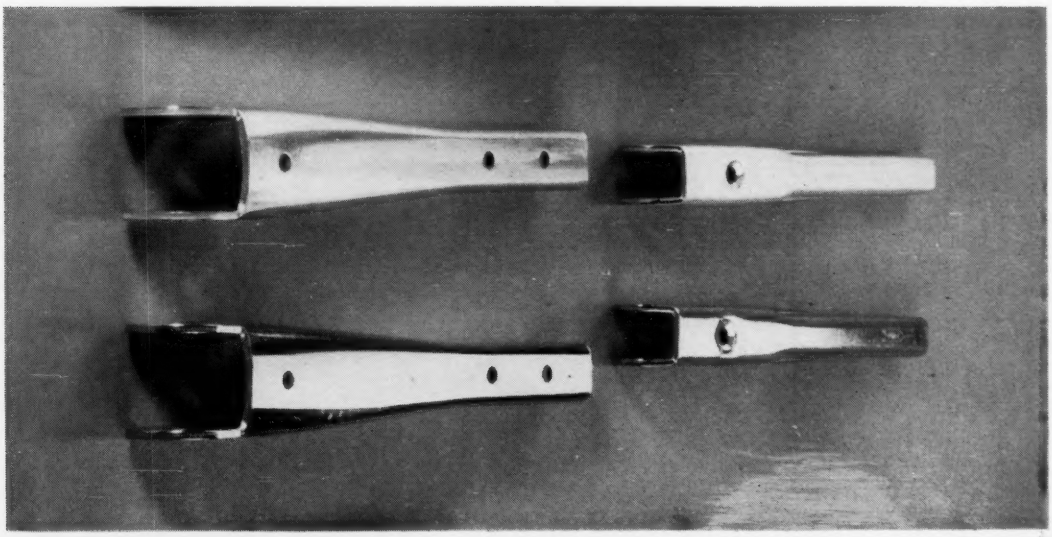




Two of these pieces are fixtured and run together in the vibrator. This cast aluminum component (above) is one yard long.

Intricately contoured stainless and carbon steel jet engine parts require deburring, radiusing and finishing (photo at centre).

Below are shown some more vital parts of a windshield wiper. Parts underneath are finished ready for bright chrome plating.



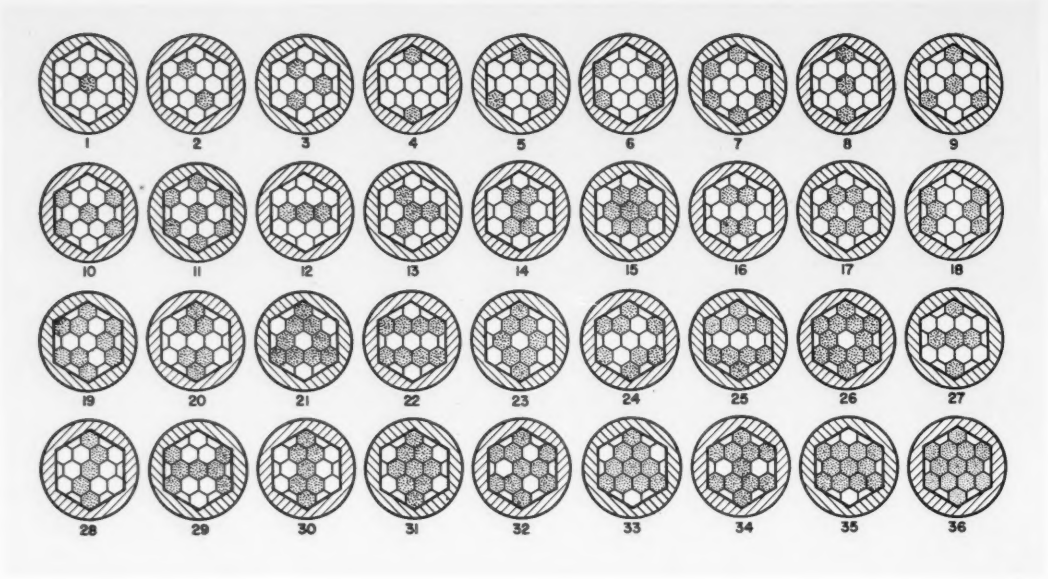


Fig. 2.1

Analysis in use of torsion bar springs

Part II of fasciculated springs article that appeared in February DE

S. Mordasewicz *Army Development Establishment*

The design of a torsion spring made up of a number of **hexagonal bars** is restricted by the requirement of providing simple and reliable anchorage at the ends. Consequently, all bars must be of the same size, in order to form a closely packed bundle, which can be fixed in plain hexagonal cut-outs at the end housings. The distance across flats (H) of the cut-outs (Fig. 2.2) must obviously be a multiple (n) of the width-across-flats (h) of component bars. That is,

$$H = n \times h$$

and the total number of bars m is given by:—

$$m = n(n-1) + 1 \quad \ldots\ldots\ldots (19)$$

Some of the corresponding cross-sections are shown in Fig. 2.2. It follows that the only factor to be assumed is the absence of longitudinal stress; that is, **all bars are polished, lubricated and anchored with adequate clearances, to allow sliding movement due to twist.**

It we consider any single hexagonal bar of a fasciculated spring, anchored in its respective position in the bundle, but twisted separately, it will generate a torque:

$$T_s = \frac{\theta G}{l} \times h^4 \times K_s \quad \ldots\ldots\ldots (20)$$

where K_s is a function of its location, that is, of the distance between the axes of the bar and the spring. In a centrally located bar (the centroid of which coincides with the axis of twist) pure torsion occurs, and the value of K_s may be found from the synthetic formula shown earlier in the Data sheet.

$$T = \frac{\theta G}{l} \times \frac{h^4}{8.678} = \frac{\theta G}{l} \times h^4 \times K_s$$

Hence $K_s = .115$

The value of K_s will be higher for the outer bars of the spring (and for all bars of a spring containing a central core of three bars) due to the progressive bending inherent in unsymmetrical twist.

If we now consider the same bar, anchored in the same position, but twisted as part of a closely packed bundle of hexagonal bars, it will generate a torque:

$$T_b = \frac{\theta G}{l} \times h^4 \times K_b \quad \ldots\ldots\ldots (21)$$

where the coefficient K_b represents the combined factors of torsional rigidity, flexural rigidity, interfacial friction, as well as of local bending and friction at the driving edges of the bars.

calculated coefficient

$$K_s = .115$$

recorded torque

$$T_r = 139.8 \text{ in. lb.}$$

recorded angle of twist

$$\alpha_r = 34.25 \text{ deg.}$$

Hence actual angle of twist:

$$\alpha = \frac{T_r \times 1 \times 180}{K_s \times h^4 \times G \times \pi} = 27.95 \text{ deg.}$$

lost motion angle:

$$\alpha_0 = \alpha_r - \alpha = 6.3 \text{ deg.}$$

or $$\alpha = \alpha_r \times \frac{27.95}{34.25} = .816\alpha_r$$

It was found that this formula can be generalized under the form:—

$$\alpha = .816\alpha_r\left(1 - 0.2\sqrt{\frac{m-1}{m}}\right) \quad ..(25)$$

in order to express the influence of the number of active bars (m) on the magnitude of the lost motion angle. Values of K_s for isolated bars were calculated by introducing test readings and bar data into equations (20) and (23) and by averaging the results. In order to check their soundness, these values (shown in Column I of Table 2.2) were used to compute the sum total of coefficients for a group of 4 arrangements containing dissimilar isolated bars. It can be seen that the figure thus obtained (shown in Column III agrees roughly with the result computed directly from corresponding test readings (shown in Column IV).

Values of K_b had to be assumed, because of the unknown proportion of the total coefficient K contributed by individual bars of a fasciculated spring. They are shown in Column II and were selected so that, when used to compute the total of coefficients for the 25 remaining arrangements, the sum obtained agrees with the result obtained directly from corresponding test readings, shown in Column IV.

Finally, the total coefficients K for various spring arrangements were computed by introducing values of single bar coefficients into equation (24). They appear in Table 2.1.

The torque generated by the twist of a complete spring must be higher than the sum of individual torques produced by component bars being twisted one by one, that is, without interfacial friction. The values of K_b will therefore always be higher than the corresponding values of K_s, and the total torque of any given spring (composed of a mixture of isolated bars and closely packed bars) may be expressed by:

$$T = \Sigma T_s + \Sigma T_b \quad \ldots\ldots\ldots (22)$$

or, substituting values of T_s and T_b from equations (20) and (21)

$$T = \frac{\theta G}{l} \times h^4 \times K \quad \ldots\ldots\ldots (23)$$

where $$K = \Sigma K_s + \Sigma K_b \quad \ldots\ldots\ldots (24)$$

An experimental investigation of these theoretical speculations was necessary, because no technical data on the characteristics of fasciculated hexagon bar springs is as yet available. Therefore a torsion spring (consisting of 13 standard hexagonal mild steel ($G = 11.5 \times 10^6$) bars, ¼ in. wide across flats and 20 in. long) was supplied by the author to the Physical Metallurgy Division of the Department of Mines, for static torsion tests.

The bars were disposed in 36 symmetrical arrangements (as shown in Fig. 2.1) and their ends anchored in appropriate housings, clamped in the chucks of a torsion-testing machine. Pieces 1 in. long of similar hexagonal rod, were inserted where necessary to position the bars correctly in their respection locations, thus providing an active length of 18 in. The magnitude of the load applied depended on the number of bars in the arrangement, providing the elastic limit was not exceeded.

The angle of twist recorded includes the intial rotation due to the side float provided by the end housings. In the case of a centrally-located bar, this lost motion angle can be computed by substituting in equation (20) the known values of arrangement 1:

In practical applications, only springs containing a full complement of component bars would be economical for space considerations. The conclusions of the present study can therefore be restricted to arrangements 15 and 36 in Fig. 2.1; that is, to 7-bar and 13-bar springs.

The value of the maximum shear stress induced by pure torsion in a single hexagonal bar was given earlier as:

$$S_s = \frac{\theta G}{l} \times \frac{h}{1.6}$$

or, substituting the value of T_s from equation (20) and introducing the actual value of K_s for pure torsion:

$$S_s = T_s \times \frac{5.435}{h^3} \quad \ldots\ldots\ldots\ldots (26)$$

Similarly, if an hexagonal bar is considered as part of a closely packed bundle, we have:

$$S_b = T_b \times \frac{5.435}{h^3} \quad \ldots\ldots\ldots\ldots (27)$$

and for the entire pack of m bars:

$$S_p = \frac{T}{m} \times \frac{5.435}{h^3} \quad \ldots\ldots\ldots\ldots (28)$$

Substituting the value of T from equation (23):

$$S_p = \frac{\theta G}{l} \times h \times \frac{K}{m} \times 5.435 \quad \ldots\ldots (29)$$

Equation (29) represents an average value of indicated stress, equivalent to combined torsion, bending and friction. The highest maximum stress (S_m) will, of course, occur in the outermost bars (submitted to the most severe distortion of their centroids) and the lowest stress, in the centre bar.

In the absence of reliable data for the stress differential between the bars, a distribution corresponding to the ratio of single bar coefficients is a satisfactory approximation. Equation (29) thus becomes:

$$S_m = \frac{\theta G}{l} \times h \times K_m \times 5.435 \ldots\ldots (30)$$

continued ▶

Torsion bar springs *continued*

where K_m is the coefficient of the outermost bar, selected from values listed in Columns I and II of Table 2.2. By substituting values of K and K_m from Table 2.2 the basic formulae for torsion of a hexagonal pack of hexagonal bars may be expressed as:—

7-bar spring (arrangement 15):

Torque: $$T_7 = \frac{\theta G}{l} \times h^4 \times .89 \quad \ldots\ldots\ldots (31)$$

Max. shear stress:

$$S_7 = \frac{\theta G}{l} \times h \times .7 \quad \ldots\ldots\ldots\ldots (32)$$

13-bar spring (arrangement 36):

Torque: $$T_{13} = \frac{\theta G}{l} \times h^4 \times 1.78 \quad \ldots\ldots\ldots (33)$$

Max. shear stress:

$$S_{13} = \theta G \times h \times .8 \quad \ldots\ldots\ldots\ldots (34)$$

Table 2.1

m	Arrangement no.	k
1	1	.115
2	2	.252
	4	.290
3	12	.375
	3	.378
	8	.405
	5	.435
4	13	.504
	16	.516
	9	.550
	6	.580
5	14	.633
	27	.665
	28	.671
	10	.695
6	17	.774
	20	.812
	18	.850
	7	.870
7	15	.891
	30	.929
	29	.967
	11	.985
8	23	1.070
	22	1.108
	24	1.140
9	31	1.187
	21	1.218
	19	1.275
10	33	1.335
	32	1.392
	25	1.404
11	35	1.483
	34	1.521
12	26	1.662
13	36	1.779

Similar formulae for torsion springs containing 3, 21, 31 or more hexagonal bars could be compiled experimentally. It should be noted, however, that the expressions for maximum stress represent only approximate values of indicated stress in areas remote from the end housings, where local stress concentrations are likely to occur.

Practical example

As a practical application, consider a torsion spring required to generate a torque of 3500 lb. in. at a twist of 35 deg. and a maximum shear stress of 100,000 psi. A quick calculation shows that these requirements can be met by:

(1) A solid round-bar spring, having a diameter of $\frac{9}{16}$ in. and an active length of 19.7 in.

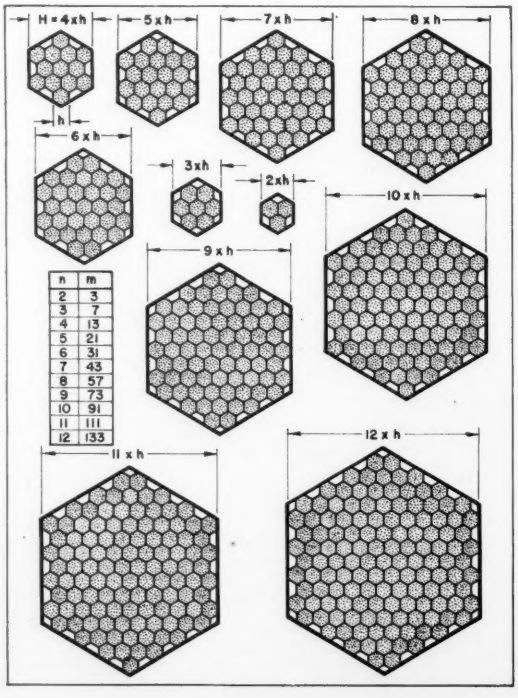
(2) A fasciculated spring, composed of 13 hexagonal bars $\frac{1}{4}$ in. wide across the flats and having an active length of 14 in.

(3) A fasciculated spring, composed of 20 laminae 0.07 in. thick and 1.4 in. wide, having an active length of 8.5 in.

Conclusions

The foregoing investigations should be treated as a tentative analysis of the characteristics of fasciculated torsion springs. The basic formulae expressed by equations (17) to (18) and (31) to (34), represent one possible solution of the problem and, although approximate, are sufficiently accurate to establish general design dimensions. *

Fig. 2.2

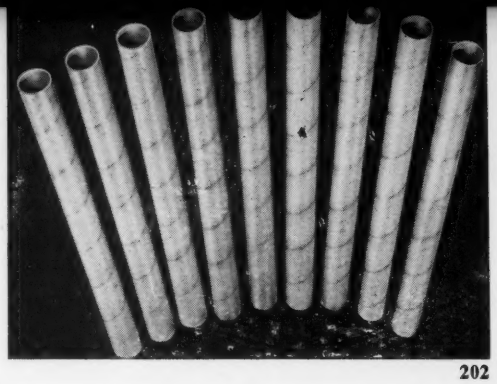


Arrangement no.	Active bars			Single bar coefficients	
				(I)	(II)
	Type	Location	Total number Σm	$\Sigma \frac{T_r \times 1}{\theta \times G \times h^4 \times m} = \frac{.023}{\Sigma m} \times \Sigma \frac{T_r}{\alpha}$ k_s	k_b
1	Isolated	Centre	1	.115	.117
2–3		Inner	2	.126	.129
4–7		Outer	15	.145	.148
8–11		Centre	4	.115	
		Outer	15	.145	
12–36			4		
	Closely packed		72		.148
		Inner	103		.129
		Centre	14		.117

Arrangement no.	Sum total of coefficients			
			(III)	(IV)
	Σk_s	Σk_b	Σk	$\Sigma \frac{T_r \times 1}{\theta \times G \times h^4} = .023 \times \Sigma \frac{T_r}{\alpha}$ Σk
1				
2–3				.252
4–7				2.168
8–11	.460		2.635	2.657
	2.175			
12–36	.580		26.161	26.162
		10.656		
		13.287		
		1.638		

Table 2.2

200

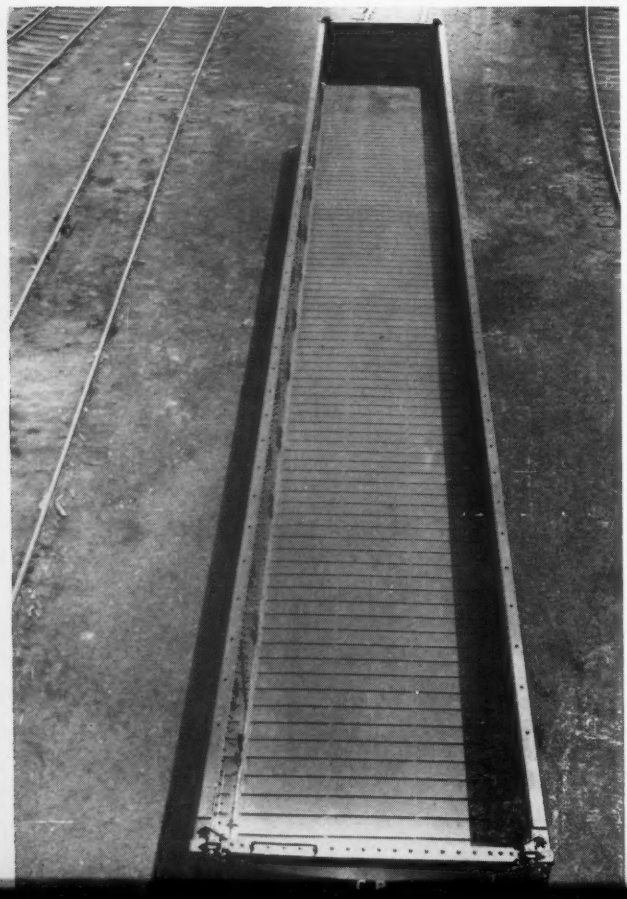


202

200 — Tomorrow's oven might look like this: made of aluminum it's completely portable can shadow appetites from buffet to patio. 201 — Low side gondola car is 65 ft long and is equipped with nailable steel flooring. 202 — Mica paper tubes are said to remain physically stable and without loss of insulation value at 1,100 deg F. 203 — This differential air pressure switch has inches of water sensitivity for airborne application. 204.— Top section of a search antenna tower. Completed tower will weigh 140 tons, stand 50-ft high. 205 — Versatility of vinyl coated steel is shown by variety of parts.

Fabrications range from flat work to deep drawing (box in right foreground). 206 — Heavy-duty tv camera mount can be used in industrial surveillance systems. It circles from side to side in continuous back-and-forth action. 207 — New flexible ball mandrel is said to give top-quality bends of a radius only twice the diameter of the tubing. 208 — Transportable inkless duplicator is just 13¼ in long, weighs exactly double its length in lbs. Copies anything written, drawn or typed. 209 — Wheel is a stroboscopic device for determining speed of magnetic tape; it is manufactured to ten-thousandths-of-an-inch accuracy.

201



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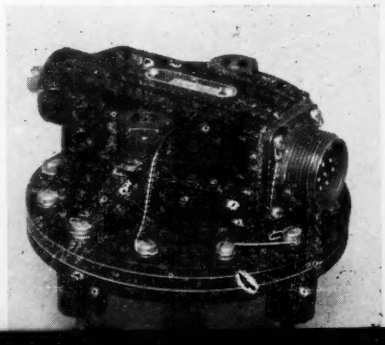

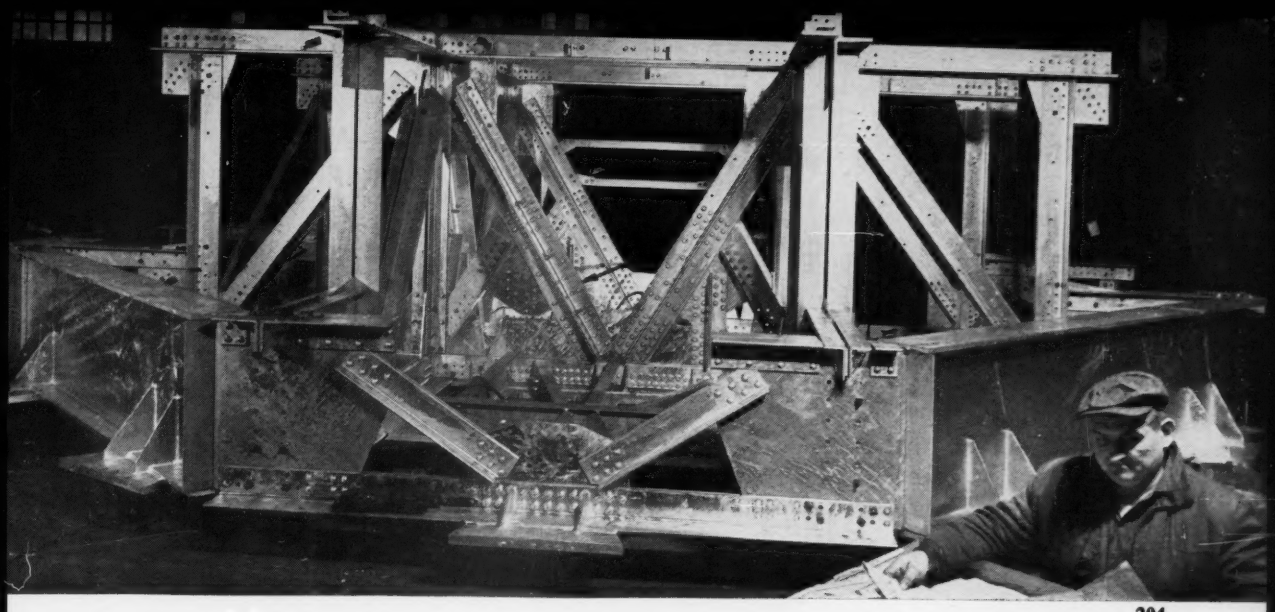

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Design news in pictures

207

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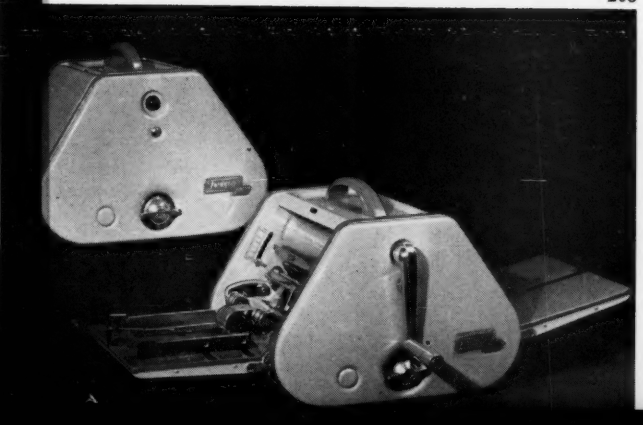

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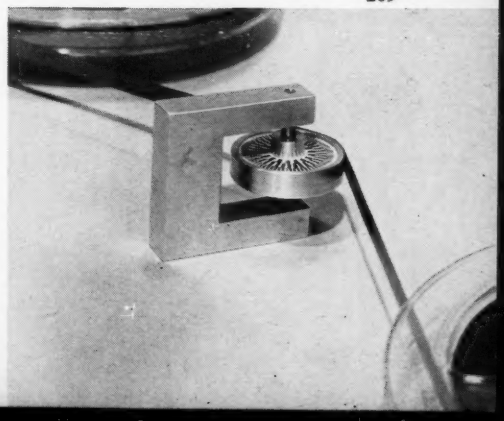


Castings: a new precision forming process

It's fast and cheap—and often eliminates secondary operations altogether

Joseph H. Cadieux

An example of the process is found in the part shown in. Fig. 1, which is produced with exceptional specification control. The part (a thumb-piece component of an ejector latch on a revolver) is of chrome-nickel-moly steel.

It was formerly manufactured as a forging, with excessive secondary machining operations. Now, the shaft diameter and centre location is held to .003 in. total variation. Secondary machining operations (formerly required) have been eliminated, a major cost reduction.

In addition, basic design freedom makes possible an edge radius of .025 in.

Fig. 2 illustrates a lock cam used on a locking mechanism for clamping telephone wire on a portable telephone switchboard. In operation, the terminal plug is depressed, spreading the two cams; when released, the spring-loaded mechanism clamps the teeth, securing the wire.

The cams are cast in stellite (a cobalt-chrome alloy) to provide superior wear resistance. The fluidity of this material enables the producer to hold an average maximum radius of .003 in. on the teeth, for superior clamping action.

The component represents an outstanding example of a part that is ideal for high quantity production techniques by the process. Almost three million have been produced to date at prices considerably less than for the original method of fabrication.

Of added interest: tolerances are held as close as ±.001 in., with no tolerances greater than ±.003 in.

As-cast tolerances on Minicast parts are normally held to a ±0.005 in. per in., while some dimensions can be held to .003 in. per in. These tolerances are, of course, typical of normal investment castings.

However, when coined, cold formed and the like, dimensional accuracy is improved. Thus, the parts can be held to ±0.003 in. per in., and some dimensions can be held to ±0.001 in.

An example of such a part is shown in Fig. 3, a special insert used in a bakelite injection mold. In operation, the curved surface acts as a cam mechanism in a limit switch. It is produced in 8620 steel, case-hardened.

The hole (which is .126 dia.) is held to ±.001 in., centre of the hole to the cam surface is held to ±.002 in., while a tolerance of ±.005 in. is held from the centre of the hole to either arm extremity.

Also of interest: several sharp edges and corners are possible, so additional machining operations are eliminated.

Obviously, parts of extreme complexity can be readily produced. The smallest cross-section produced in commercial applications to date is 0.032 in. thick, but parts as thin as 0.020 in. have been produced experimentally.

Fig. 4 is a jaw, a component of an automatic riveting gun. In operation, the jaw grasps the rivet diameter and thus controls ejection.

In designing the part, various production processes were evaluated, then ruled out because of excessive costs.

By this process, it is produced in 4140 steel for only 15 cents apiece; secondary machining operations are not required.

As an example of dimensional control, teeth measuring .010 in. wide by .010 in. deep can be cast with a 32 pitch. An over-all section thickness of .058 in. is held to a total variation of only .003 in.

The process does this

A method of precision forming (the Minicast process) successfully combines the basic advantages of investment casting with those of other precision methods, such as coining cold-forming and the like. To the design engineer, the process provides a totally new design freedom for producing precision parts much cheaper.

Its ability to compete with methods like screw machine production, die-casting, cold heading and so on, depends on the production of so-called miniature parts, with a volume of less than 1 cu. in.

Other advantages are: exceptional tolerances; the ability to produce parts with extreme configurations; relative freedom of alloy selection; superior surface finish.

Parts can be produced at the rate of 25,000 to 50,000 a day as compared with 500 to 1,000 a day by conventional investment casting.

Alloy selection: As with basic investment castings, the process under review is particularly suitable for difficult-to-machine materials, since the close tolerances obtained reduce (or eliminate) machining requirements.

The alloys most suitable include high alloy steels, tool steels, so-called super-alloys and stainless steels. In addition, low-alloy steels can be used.

Of the non-ferrous metals, the only unsuitable ones are magnesium alloys and the high zinc-copper alloys, although the process has not yet been applied to such metals as titanium and zirconium.

Obviously, the broad selection of alloys available has already provided important benefits to many users. For example, Fig. 5 illustrates an armature used on a relay device of an electronic assembly. It is produced in iron (1% silicon) highly advantageous from a magnetic standpoint due to its nearly 100% carbon-free content.

The yoke (shown in Fig. 6) is an electrical relay-system component produced in beryllium-copper 20-C. This alloy was used because its electrical and abrasion characteristics are superior to the original material used.

In addition to maintaining the electrical characteristics required, beryllium copper has the added advantage of hardenability for greater wear resistance.

Fig. 7 is a key for a clarinet, formerly made from an assembly of five industrial stampings or forgings. Manufacturing costs and assembly time were excessive.

By the Minicast process, the part is now produced in nickel-silver for maximum corrosion resistance at much less cost. This alloy was chosen because of its ductility, so that the customer can make minor adjustments after assembly. The material also provides a smooth surface finish that requires only buffing.

Surface finish. The process provides parts with excellent surface finish. In fact, finishes featuring 30-50 micro-in. are not uncommon, depending on the alloy used.

The part shown in Fig. 8 (a cylinder stop used on a .22 calibre revolver) is produced in a chrome-nickel-moly alloy. Of particular importance to the customer is its uniform cast surface (50-60 RMS) which insures freedom from burrs and machining irregularities.

Other benefits: the small spring hole is produced as a part of the basic operation, thereby eliminating drilling; the bent shaft configuration results from the original casting, without secondary operations.

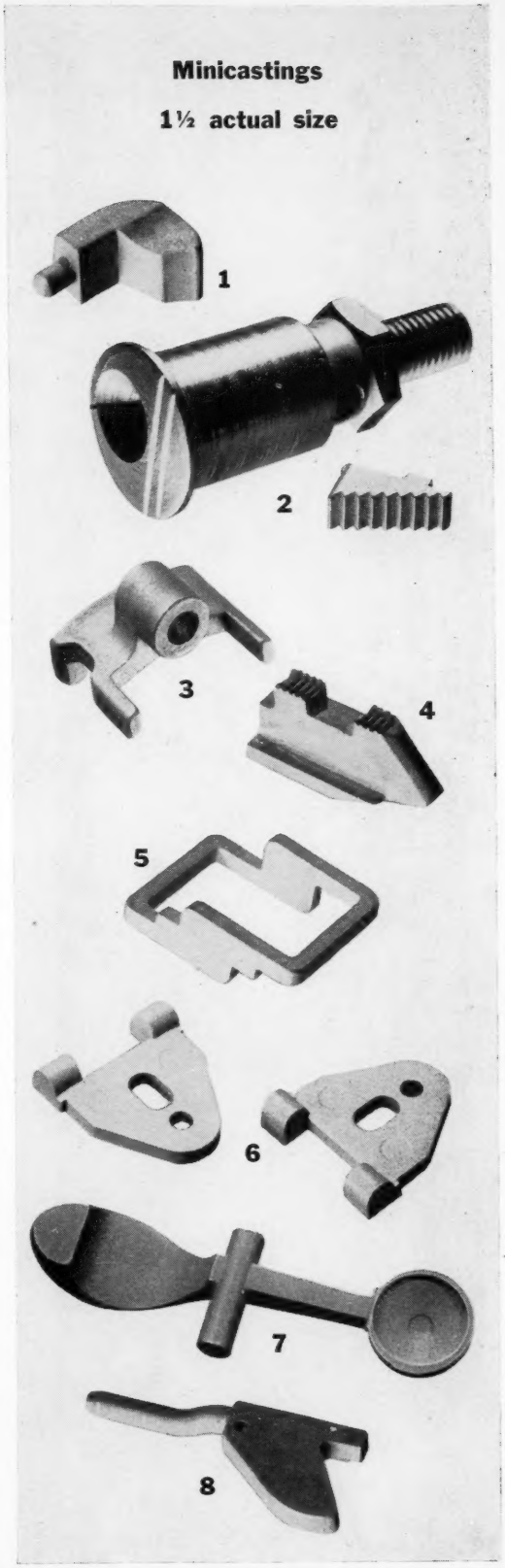
Additional design considerations

Contrary to common thinking, conversion to a Minicast part (where this part was previously produced by screw machine, die-casting or stamping) does not normally require any basic redesign of the part, except where it is desirable to take advantage of certain design features not possible with the previous production method.

This is important, for many design engineers feel that, to obtain the basic advantages of the process, it is necessary to have a complete new line of thinking (and a complete change in basic design techniques).

Actually, nothing could be farther from the truth. Approximately 75% of the parts now being produced by the Minicast process use the same blueprints as for the previous precision forming methods. Most of the remaining jobs have been redesigned merely to incorporate new features that were not possible before. ★

Mr. Cadieux is vice-president of Castings Engineers Inc., and thanks are due that company for use of photos.



Porcelain enamel

DE staff written from information supplied by Porcelain Enamel Institute, Inc.

The fabrication of parts to be porcelain enameled nearly always involves the bending of the metal at an angle (usually 90 deg) along one or more sides of the piece. This may be a drawing operation (where all four sides are flanged at once with closed corners) or carried out on a forming press or brake, the corners then being welded to rim-bind the piece (Fig. 1).

When only one or two sides are flanged, the work is carried out on a forming press, welding being used in that case only if two flanges meet.

Whatever the forming process, if the parts are to be enameled in white or light colors, the radius of curvature should never be less than 3/16 in. (Fig. 2).

A radius less than this results in burning-off the ground coat and cover enamels, and difficulty in securing suitable finish coverage. When a ground coat or dark-colored finish only is to be applied, it is permissible to reduce the radius somewhat, but in no case should it be less than 9/64 in., even for dark colors.

This is a basic principle for trouble-free design. Time and again, excessive losses through chipping have been caused by sharp bends. The trouble has usually been overcome when the radius has been increased.

Sharp bends (it is sometimes claimed) are necessary where close joints are required. Little or nothing is gained in appearance, however, and the tendency to chip in processing and erection is much greater.

The enamel tends to pull away from sharp points because of surface tension, to overcome which more finish enamel has to be applied. There is thus more risk of chipping (fig. 3).

Since flanges are essential if parts are to be kept flat and straight, their depth is important. Where used, the depth should never be less than ⅜ in., and if punched with holes for mounting, ½ in. is far more desirable.

Where a large flange (1 in. or more wide), is visible on final assembly, it is usually essential to keep it entirely straight and at an exact angle. This is very difficult unless the flange is properly supported somehow during the enameling operation. By far the safest design (where it can be applied) is to make the end flanges equal in depth to the long or exposed flange, or at least so that the ratio of end flange (or side flange) to exposed flange equals 1/3 (see Fig. 4c). If this is impossible, because of some feature in the design, a light gauge strip may be spot-welded to both flanges as reinforcement bracing (See Fig. 4d). This is not desirable, however. In no case should the angle brace be welded to the back of the surface to be finished.

In some cases, where the ratio of length of the piece to depth of the exposed flange is unusually large, it may be found that these recommended methods of maintaining a straight flange will not be sufficient to hold it in line. If this is so, the difficulty can be overcome by providing temporary intermediate bracing strips between the end flanges. These are cut off afterwards.

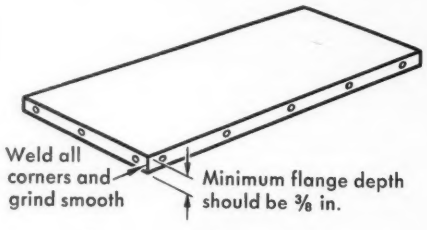


Fig. 1

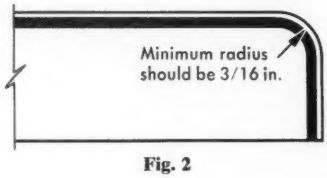


Fig. 2

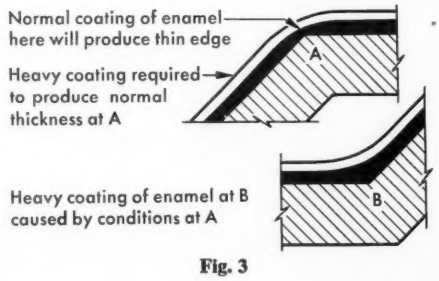

Normal coating of enamel here will produce thin edge
Heavy coating required to produce normal thickness at A
A
Heavy coating of enamel at B caused by conditions at A
B

Fig. 3

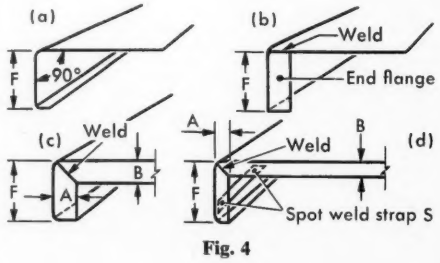


Fig. 4

Design Engineering DATA SHEET

Cutouts, notches and large holes (5/16 in. or larger) in flanges (especially narrow ones) should be avoided if possible, for they weaken the flange locally. All the stresses set up in the handling of the part are concentrated at such points. They are transmitted to the flat surface the flange is intended to reinforce and damage too often results (See Figs. 5 and 6). Where flange notches or cutouts cannot be avoided, the corners of the cuts should conform to a ¼ in. (or larger) radius and the die used in making the cut set not too close in order to push the metal toward the inside of the flange along the edge of the notch or cutout. This "extruding" or "burring" of the edge of the notch (together with the radius corners) will strengthen the flange and to some extent reduce the weakness of such a design.

It is considered good practice to weld open corners where flanges meet. This gives greater rigidity to the part, lessens the tendency to warp or distort in enameling and reduces the danger of chipping in handling and assembly. The welding of corners may be dispensed with under certain conditions, such as on parts to be finished in black or dark colors, or even on linings or parts where the corners are not seen. Where greater flexibility for mounting is required, some manufacturers find that they can provide it by welding only the top corner of the joint.

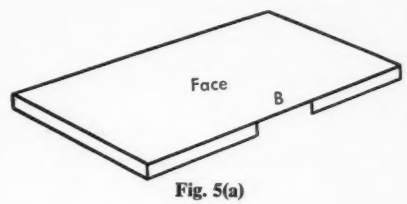


Fig. 5(a)

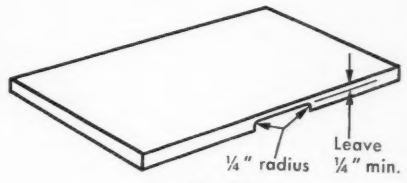


Fig. 5(b)

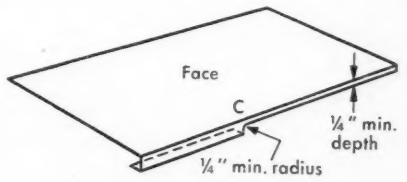


Fig. 6

To improve the appearance of a large flat area (or to provide added rigidity to counteract the tendency to warp) parts are frequently embossed (See Figs. 7a, 7b). In all cases, the radii of the corners of the embossing should not be less than the 3/16 in. recommended above as sound practice for finishing on white or light colors. Too frequently this phase of stiffening offsets is overlooked, with a resulting loss in enameling operations.

Make embosses symmetrical with the outline of the piece. Unsymmetrical embossing tends to set up uneven stresses in the part, and cause distortion and warping.

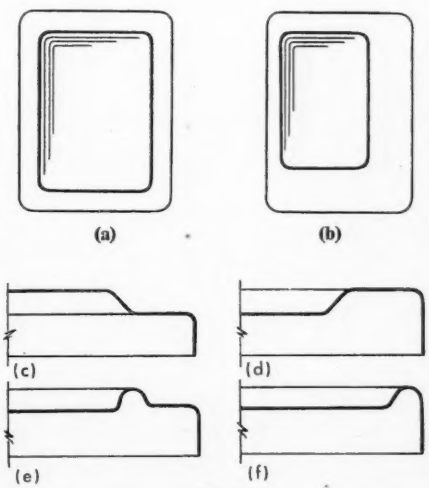


Fig. 7

Elimination of waviness along flat edges is often overcome by providing raised edges of distinctive design (see Figs. 7c, d, e and f). Care must be taken in using this construction, however, that the excess metal is worked out to the edge and not to the centre, otherwise an "oil can" effect may be produced.

Occasionally, the details of the assembly will require the welding of an angle or strip to the back of the part. Great care is necessary with this construction to prevent buckling and warping due to the uneven heating and expansion caused by different thicknesses of metal. ★

Ideas round-up

Solenoid: co-operation benefits industry

Solenoids have been used for years by the housewife in her automatic clothes washer, dishwasher and other household appliances, and have worked out well. Industry has also used solenoids to a limited extent.

However, with the rapid growth of automation in the past decade, there is a need for small industrial ac solenoids to produce a force between 1.7 and 2.4 lb. on a ½ in. stroke.

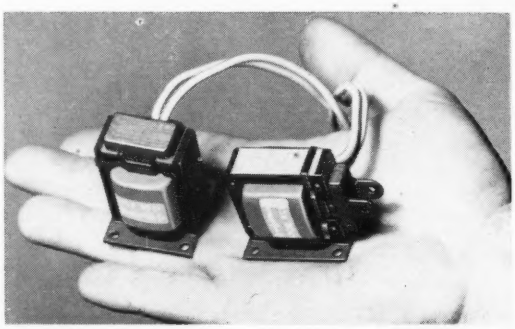
The solenoid used up to this time generally had only to work at short, intermittent periods. Industry needs something that can work longer and harder with no breakdowns.

Allegheny Ludlum Steel Corporation and Detroit Coil worked on a co-operative program to get special solenoid steel that had good physical characteristics (resisting peening and cracking) and also provided excellent electrical characteristics.

A second phase of the program was the proper choice of coatings for the steel to provide inter-laminar insulation to reduce eddy current losses in the structure. The final result of the program was a specially coated silicon steel ideally suited to solenoid manufacture. It is available in the form of stampings.

The new 01 and 02 series solenoids have been field tested and recently been accepted in the electric timer field and the automatic door control field.

The new solenoids will have a wide application for small value operations and machine tool actuators where long life and reliability are required. **(210)**



Wet magnetic particles: a quick test of ferrous parts

A completely re-engineered testing unit, the NQ-242, has recently been announced by Magnaflux Corporation. The unit employs the wet magnetic particle inspection method (either visible or fluorescent) and provides a quick means of production testing small ferrous parts up to 24 in. long.

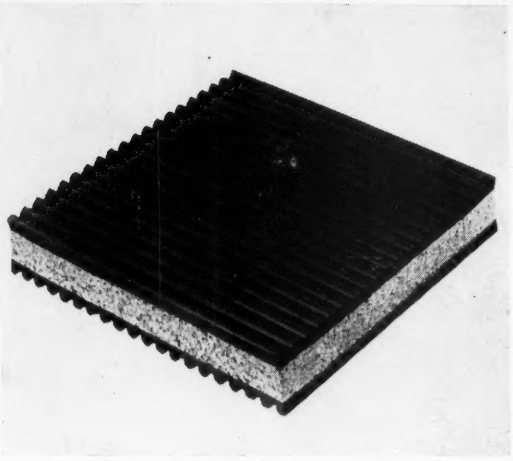
The suspended magnetizing coil and heads permit conveyorization of parts either through or across the unit. The coil (which pivots and slides along the overhead track) may be positioned between the heads for both longitudinal and circular magnetization of parts, moved to the right for separate coil magnetization, or stored at the extreme left when not in use.

Other features include: recessed front panel and 38 in. table height for sit-down operation; removable and reversible grilles; infinitely-variable current control; built-in line disconnect switch; and stainless steel tanks to accommodate either oil or the new water-suspendible magnetic particle baths.

The unit operates from 220/440 volt, 50/60 cycle, 3 phase current. Magnetizing output is 1,750 amps d-c through the heads and 600 amp-turns through the coil (a-c versions of the same unit are available).

Inspection is performed by placing the part between the heads or in the coil. As the magnetizing current flows the part is flooded with a solution containing fine magnetic particles, either visible or fluorescent. The particles accumulate along any flaw, clearly marking all defective areas. Black Light reveals the fluorescent particles as glowing indications. **(211)**

Isolating material: in sheet or sandwich it reduces vibration and sounds



Neoprene mounting pads for isolating vibration, preventing machinery travel and deadening noise are now available from T. R. Finn & Company.

Known as PadZorbers, these 18-by-18 in. ribbed sheets can be cut to any shape to fit under the feet of punch presses, drill presses, lathes and other machinery, as well as laboratory tables, air conditioning units and so on. Trimmed quickly and easily with knife or shears, they reduce vibration by as much as 80%.

The sheets have deep, rugged cross-ribs molded on each side, the ribs on one side being at right-angles to those on the other side, to eliminate machinery travel.

Manufactured in load ranges up to 3,500 psi, PadZorbers may be used without bolting or built-up bases. Under extremely heavy loads, steel bearing plates are recommended for even load distribution.

They are also manufactured as "sandwiches" containing Isolant, Finn's special isolating material which, in effect, floats the unit to be isolated on a cushion of air. These, too, are made in the same load ranges.

(212)

Thin wall tubing: helps increase rocket performance

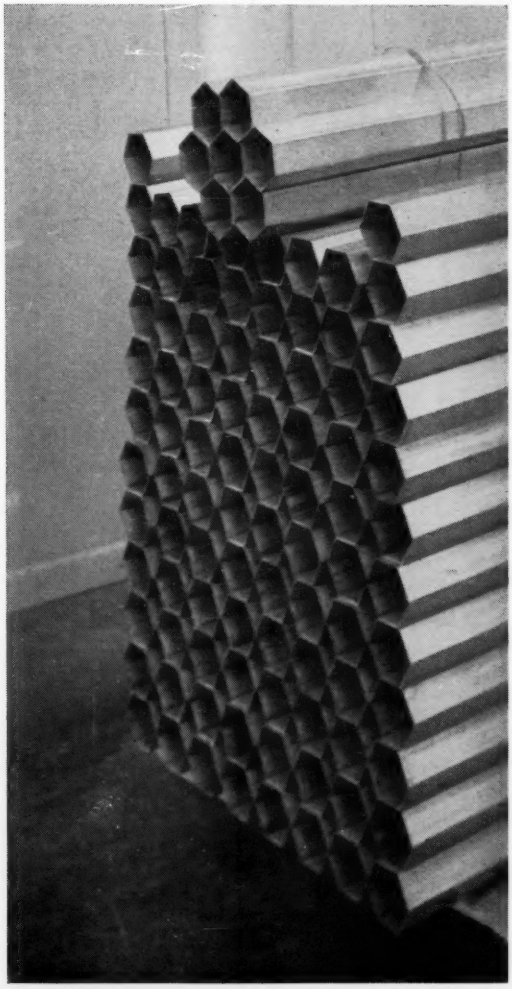
(213)

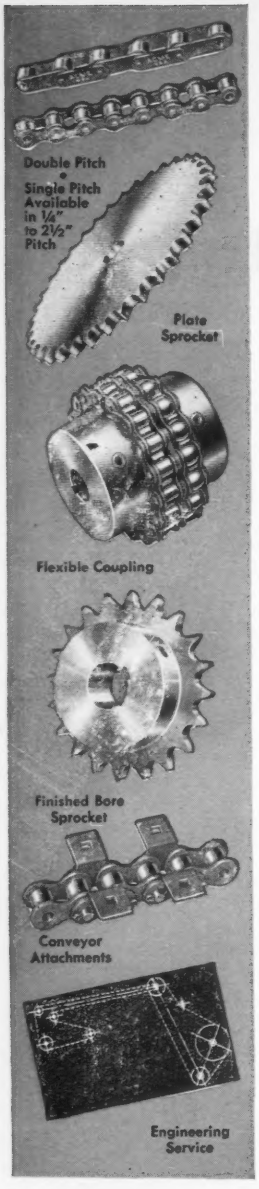
NTH Products, Inc. manufactures its Precisionweld Thinwall tubing from practically every available corrosion-resistant steel and metal or alloy (except aluminum, magnesium, the copper-base alloys and pure molybdenum) in wall thicknesses from .008 to about .125 in. and diameters from about 1 to 15 in. Larger diameters up to 30 in. have been produced on existing equipment in lengths up to 5 ft.

The advantages of using this tubing are well-shown by these details of a solid-propellant, rocket-motor case.

Up to about 18 months ago, the parts were mostly heavy-wall cylinders with heavy forged ends, assembled by hand arc-welding or, at best, boilermaker techniques. The designers naturally wanted to reduce the rocket motor case weight to increase the performance of the missile. Several hundred motor cases of precision welded, high-strength material, were therefore produced, but it was necessary to make welds which protruded outside the tube wall by at least 10% of the wall thickness. This was because the weld would not heat-treat to the strength of the parent material, so it had to be thicker for equal strength. Such a weld required the addition of filler rod.

NTH decided that, if stainless steels could be welded without rod addition, there must be a way to do it in the low-alloy, heat-treatable steels. Techniques were developed and test after test showed that the seam-leveled, pure fusion weld (without any filler rod) had, when heat-treated, a strength equal to that of the parent metal. Furthermore, burst tests of the finished motor cases consistently failed in areas remote from the weld.





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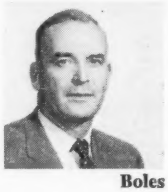
People in the news

James Boles has been elected president and a director of Ward Leonard of Canada. Mr. Boles is a native of Saskatchewan and a graduate of Queen's University. Mr. Boles has served in engineering, production and quality control capacities with several leading Canadian companies.



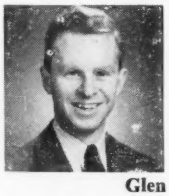
Boles

Strong

The appointment of **C. C. Strong** as microwave communications sales specialist has been announced by Canadian General Electric Co. Mr. Strong will be the company's representative in the growing field of microwave communications systems.

* * *

A native of Montreal and graduate of McGill University, **John Glen** has been elected president of the Ontario section of the Society of Plastics Engineers. He



Glen

Argue

is district sales manager of the plastics division of Canadian Industries Ltd. and a member of the executive council of the above mentioned society.

Fred W. Argue, born in Parry Sound, Ont., has been elected executive vp of Stone and Webster Engineering Co. Formerly vp and engineering manager of the Boston organization, Mr. Argue thus becomes a chief executive of one of the largest engineering and construction organizations in the world.

* * *

A number of senior appointments have recently been announced by Dominion Bridge Company, together with some reorganizational changes. Regional vp **P. E. Savage** will administer the eastern region. New vp in charge of the Ontario region is **Mackenzie McMurray**, with **E. A. Ford** heading up the central region

People in the news

(Continued from page 72)

as vp. In the western region **R. J. A. Fricker** has been named regional vp. Formerly vp and manager of the eastern division, **Robert S. Eadie** has been named vp and director of engineering. To the post of vp and manager of the new marketing services group — **George H. Midgley.**

* * *

For the third successive year Canadair is offering scholarships to sons of employees to assist them to get undergraduate training in engineering or allied science. Included in the six boys who have been awarded scholarships to date—**Raymond Dionne** (he hopes to become a civil or mechanical engineer) and **David McCutcheon** now in his third year of mechanical engineering at McGill.

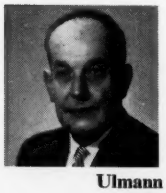
* * *

Bell Telephone Labs and the American Institute of Electrical Engineers have announced the establishment of an award for achievement in telecommunications. It will be known as the Mervin J. Kelly Award, and is named in honor of **Dr. Kelly,** formerly president and immediate past chairman of the board of Bell Laboratories.

Dr. Kelly retired on March 1 after 41 years of scientific and administrative service with this company. The prize will comprise a bronze medal, a cash stipend of $1,000 and a certificate. First award will be in 1960 and will be to the individual who has made an outstanding contribution to the advancement of telecommunications.

* * *

A new division known as the Gear Products Division has been formed by Dominion Engineering Co. **Mr. Hans Ulmann** has been appointed manager: he was recently chief engineer of the industrial division. **Mr. G. E. Plant** takes over the post of sales manager.



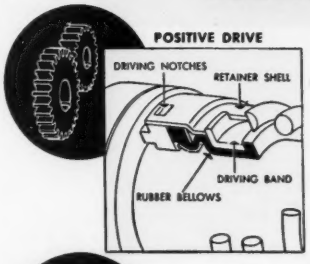
Ulmann

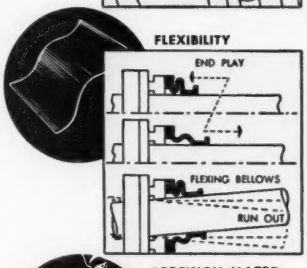
Plant

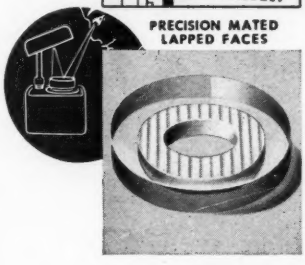
At the Polymer Corporation in Sarnia, **N. J. McCracken** heads the over-all research and development program under **Dr. E. J. Buckler.** Project manager is **Dr. H. L. Williams.** ★

JOHN CRANE

Shaft Seal Design With A Purpose!







POSITIVE DRIVE

This gives long seal life. Drive is transmitted through the driving band and washer driving notch which absorb all breakout and running torque. Damaging stresses on the bellows or flexible sealing member are eliminated. Slippage is also eliminated, thus protecting shaft or sleeve against galling.

FLEXIBILITY

Axial and radial misalignment problems are eliminated. Self-adjusting bellows or sealing head automatically compensates for shaft end play or run out. Minimum spring pressure is required for axial shaft movement and uniform spring pressure is maintained during radial shaft movement.

PRECISION MANUFACTURE

Leakproof performance is assured. Washer and seat surfaces are precision lapped to a perfect mate under a patented "John Crane" process.

A SEAL FOR EVERY SERVICE

All "John Crane" Seals are constructed to the particular service requirements . . . from hot or cold water to the most destructive acids, corrosives and gases . . . temperatures up to 1000°F. . . . pressures to 1200 psi. They can be furnished in types and sizes to meet practically any mechanical or dimensional condition.

Request Bulletin S-204-2. Containing full information on "John Crane" engineered shaft seals.

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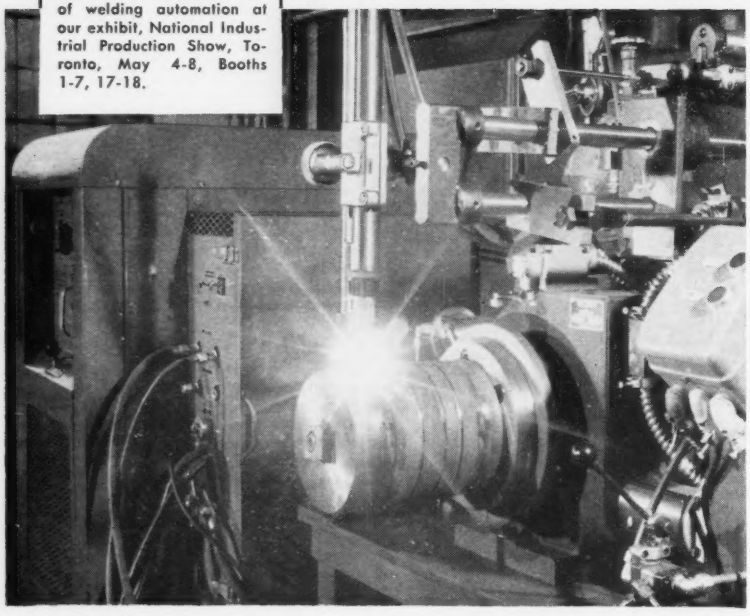
SEE actual demonstration of welding automation at our exhibit, National Industrial Production Show, Toronto, May 4-8, Booths 1-7, 17-18.



Four electric motor field cores automatically welded in one operation at Robbins & Myers Co., Brantford, Ont.

Automatic ARGOWELDING doubles production rate

FIVE YEARS AGO, Robbins & Myers Co. of Canada Limited, a leading electric motor manufacturer, recognized the many production advantages of automatic Argowelding. The first automatic Argowelding machine proved so efficient in raising quality and increasing production that a new unit has been installed for high-speed assembly of electric motor field cores. These cores, a series of thin steel laminations tightly packed together, are welded automatically, four at a time.

Argowelding equipment is completely automated. When the control button is pushed, the Argoweld torch with its argon-shielded arc moves across the laminations at a pre-set uniform speed, fusing the edges together. No filler metal is used. On reaching the opposite side, the arc is broken, the fixture indexes the arc assembly, the arc is struck again with the torch travelling in the opposite direction, and so on.

Robbins & Myers report that assembly is done more efficiently, in half the time previously required, and production has been doubled.

For complete information on automatic Argowelding, or any gas or arc welding process, equipment or supplies, contact your nearest L.A. Branch or authorized dealer.

Canadian LIQUID AIR Company
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Branches, plants, stores and dealers from coast to coast.

Circle number 113 on time saver card

Keeping informed

New booklets and technical data for you to read

Plastic terms—big problem today is keeping abreast of new materials. Phillips Chemical Co. have published a glossary of plastic terms in book form—from "A-stage" to "wire strain."

Speed reducers—the worm gear type by Winsmith are dealt with in an illustrated 12-page booklet. It refers particularly to double reduction hollow shaft gears.

Rotary screw compressor — descriptive literature on the 600 cfm portable.

Advance relays—folder shows the specifications of advance relays for aircraft, missile and industrial use. Cannon Electric.

Fan noise calculator—if noise is a blight with you or you need to predict room noise levels, then you'll be interested in the slide chart put out by Propellair.

Selenium rectifiers—an illustrated folder by Syntron Co. presents data and specifications for cell sizes from 1 in. square to 12 by 16 in.

Barium ferrite magnets — the D. M. Steward Mfg. Co. have a folder describing their F-300 ceramic permanent magnets.

Split-second timers — describes the precision units made by Sphinx-American which feature elapsed time indications and time-out provisions.

O-rings—booklet published by Garlock Packing Co. gives useful information for dynamic sealing and static gasketing together with illustrated design information.

Magnetic amplifiers—a swatch of application notes by Magnetic Controls Co. make full use of diagrams, practical problems.

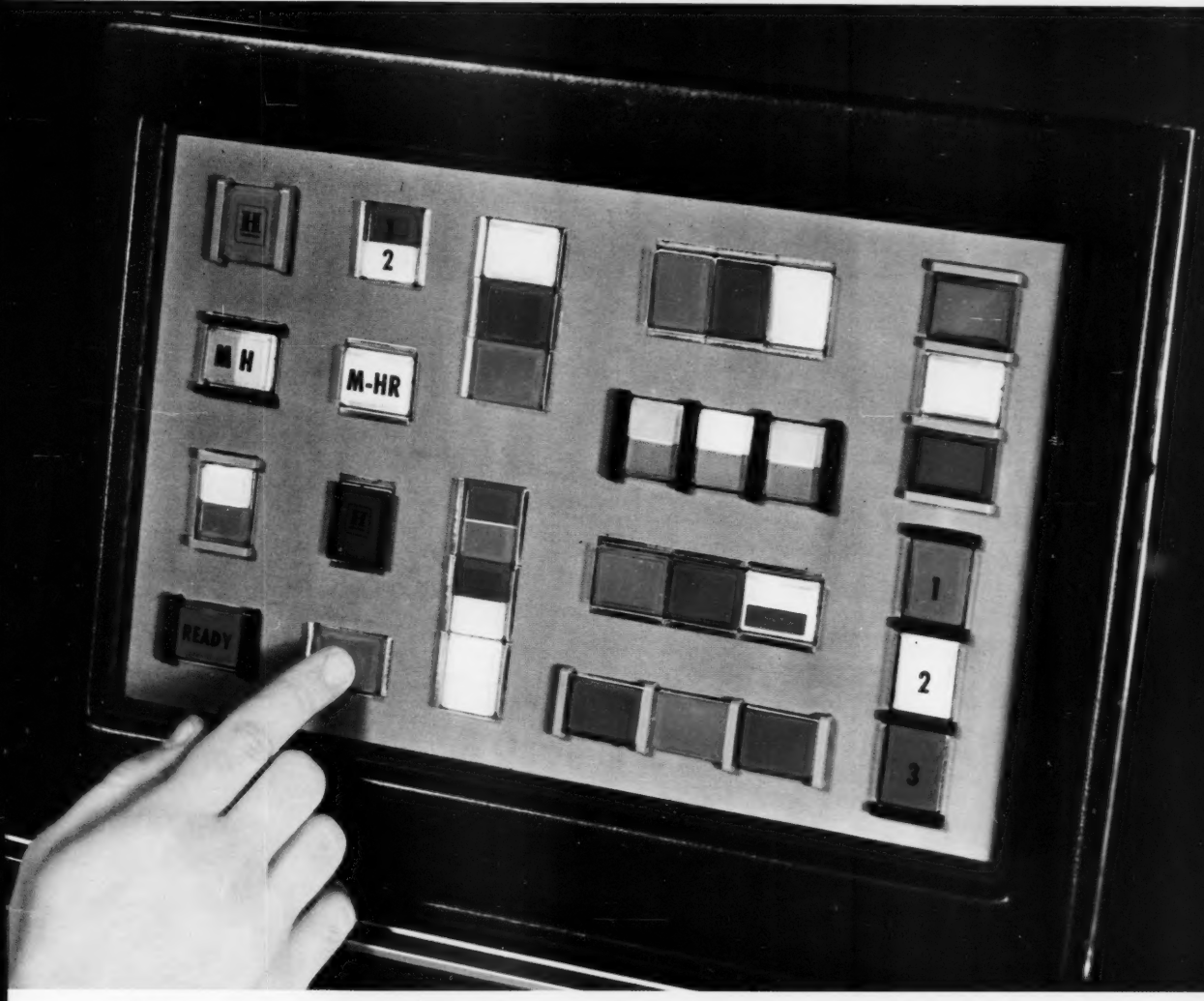
Air conditioning—but also heating and ventilating and air cleaning-concerns catalogue BFS-2 by Sturtevant Co. of Canada.

Hi-tensile fastening—this booklet was compiled as an aid in the selection of the appropriate nut and bolt combination for high strength applications.

Flexible couplings—new trade catalogue contains helpful information on the various types of Acme Chain Co.'s extensive line of products.

V-belt drives—32-page booklet on design information, service level analysis and tensioning instructions.

Atmospheric pressure—American Society of Engineers has published the third edition of Instruments for the Study of Atmospheric Pressure. ★



All new Series 2 lighted display and pushbutton switch devices offer new modular versatility in lighted display

The modular concept of Series 2 devices opens a new approach to design freedom in both front-of-panel lighted display and back-of-panel precision pushbutton switching. The demonstration panel shown above illustrates some of the variety in arrangement and color and labeling offered by these new devices.

Principal advantages of Series 2 units include these:

Operator-indicator and indicator units are assembled quickly and easily, *without tools*. Even the switching units simply snap into place as shown on the next page.

Units are available, flange mounted or barrier mounted, in long-flange, short-flange, long-barrier and short-barrier types. All types can be combined in either rows or columns to provide eight group-mounting schemes.

Five colors of display screens are available—red, yellow, blue, green, and white. Two, three, or four lamps can be used in each unit. Color filter caps for the lamps are available to provide projected color on white frosted screens.

Two-color display screens may be split laterally or longitudinally, in any combination of the five colors.

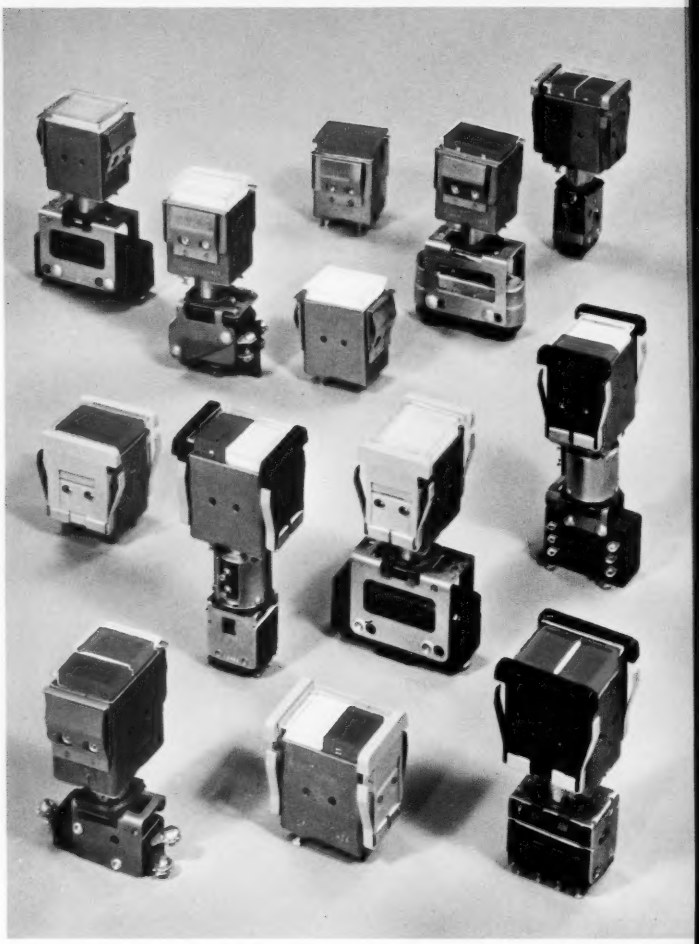
Assemblies built up of the desired number and type of units, snap into pre-cut rectangular slots in the mounting panels, *also without tools*.

Panels may be from 1/16″ to 5/16″ thick. Flange-mount units can be used with a mounting panel and overlay panel, or with mounting panel only.

Here is a new dimension of design freedom in illuminated switching equipment . . . an all-new system compatible with good human-factors engineering.

MICRO SWITCH Precision Switches

All new Series 2 lighted display and pushbutton switch devices offer new modular versatility in pushbutton switching



Yes, you can have the panel arrangement you want (preceding page) *and* the switch unit the application requires. At right you see a few of the hundreds of available combinations of Series 2 switch units and operator-indicator units. To attach an operator-indicator unit with a switch unit, just snap them together. All such combinations are available with or without magnetic d-c holding coil. Switch units are offered with switches from eight different MICRO SWITCH series of basic switches—"TB", "SM", "HS", Type "A", "MT", "DT", Type "Z", and "V3". Included are switches for low-energy circuits, switches for handling d-c loads of up to 10 amperes, 125 volts, and for direct control of a-c motors of up to two horsepower . . . alternate-action units, momentary-contact units, and units for control of multiple circuits.

Display screen, in four colors and white. Also available split lengthwise or across.

Two, three, or four lamps can be used in operator-indicator or indicator units.

Operator-indicator unit, barrier type. Unit shown has long (side) barriers. Also available are short (end) barriers, and flange-type units without barriers.

Color filters in red, yellow, green, or blue fit over lamps, permit projected-color lighting.

"SM" switch unit—one of many Series 2 switch units—snaps onto base of operator-indicator unit.

Indicator unit, long flange type. Short flange and barrier types are also available.

New Catalog 67 describes Series 2 devices in detail. Split pages aid selection of components. Contains detailed switch unit data and helpful ordering and color selection information. Sent free on request.

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Sems are particularly effective where stress and vibration occur and often permit re-design because they can be used in cramped spaces and because with superior holding power fewer fasteners are required.

Where vibration is a factor in fastening — ask also for information on STELCO "Spin-lock" Screws.

Stelco will make a special Sem to fit your requirement if one of the many Standard types immediately available is not exactly what you need.

Contact any Stelco Sales Office.

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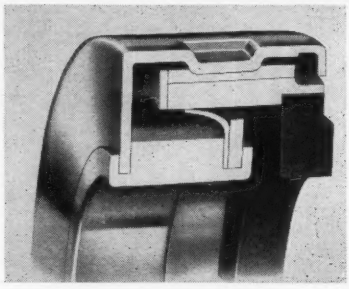
New products & materials

Shaft seal

Now in actual production is a "Met-L-Seal" — an all-metal shaft seal that functions at temperatures ranging from —65 deg to plus 850 deg F.

Engineered and produced to achieve "missile reliability" by **Gites Bros. Mfg. Co.** — the seal is designed to operate at temperatures above 850 deg, limited only by metallurgical progress in high-temperature alloy steels.

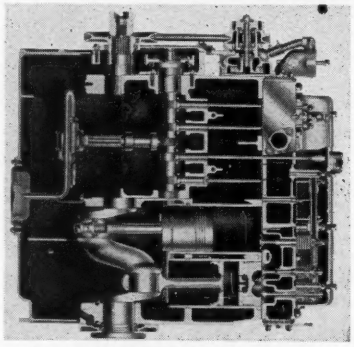
All components (except the seal face) are made of various high-temperature alloy steels, each with the optimum combination of properties necessary to its function. Face materials are of carbon graphite or various exotic alloys.



This construction permits no internal fatigue (say manufacturers) and gives positive guarantee against sudden complete operational failure and other drawbacks of synthetic-elastomer seals in extreme operating conditions. **(214)**

Direct injection diesel engine

A new four-cylinder, direct-injection diesel engine for farm tractors, combine harvestors, boats and industrial equipment is announced by **F. Perkins Ltd.** The new engine has a 4.25 in. (108 mm) bore, 4.75 in. (120.6 mm) stroke, and 269.5 cu in. (4.42 litres) capacity. Maximum torque is 189 lb ft for agricultural



engines and 172 lb ft for industrial units, both reached at 1,000 rpm.

Features of the Four 270D include the mechanically-governed, distributor-type fuel pump; a large capacity lift pump, push rod operated from an eccentric on the fuel pump drive hub; cast iron wet liners; and a low level camshaft with the maximum diameter between the cams to give rigidity. **(215)**

Servo-potentiometers

Six new models of high precision servo-

potentiometers combining high precision and electrical characteristics are now available.

They feature precision drawn alloy resistance wire, linear, or nonlinear winding and multiple taps, low torque operation.

Precision machine parts and ball bearings give high mechanical accuracy say **International Resistance Co. Ltd.** **(216)**

Pressure Transducer

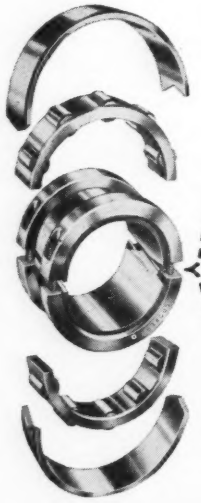
The Dynisco PT49 strain-gauge pressure pickup features a flush-mounted pressure diaphragm with a double-spiral cooling

(continued on page 74)

SAVE "DOWN TIME" WITH

COOPER

split ROLLER BEARINGS



Split right down to the shaft

Cooper Split Roller Bearings have all the advantages of conventional roller bearings, PLUS being SPLIT—right down to the shaft! For mounting, Cooper bearings are assembled around the shaft—not pushed or pressed on the shaft. They may be mounted where it is impractical or impossible to mount conventional solid race bearings.

The unique SPLIT feature saves "down time", money, and space. With Cooper bearings you get all the advantages of regular roller bearings with a Big PLUS!

Superb construction, high load-carrying capacity, and long life make Cooper Split Roller Bearings the first choice with designers and maintenance engineers.

Why not find out for yourself? Send for the latest catalogue and see what Cooper's big PLUS can do for you.

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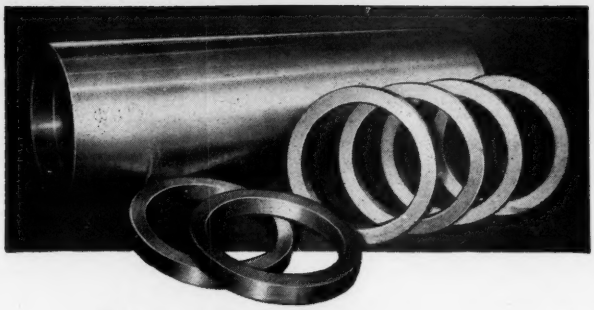

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. . . alloy steel, bronze
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Notable Improvement in Machine Design

How to improve the strength or wearing quality of certain machine parts without materially increasing costs has been a problem for many design engineers. Centrifugal casting by Kennedy is helping to solve the problem. Kennedy centricast metals are extremely dense, with excellent physical properties.

Cylinders of various diameters, lengths and wall thicknesses . . . supplied rough machined on inside and outside diameters, as semi-finished blanks, or as assembly parts fully machined to specifications, such as cylinder liners, ring gears, cages for roller or ball bearings, straight or flanged bushings and other parts.

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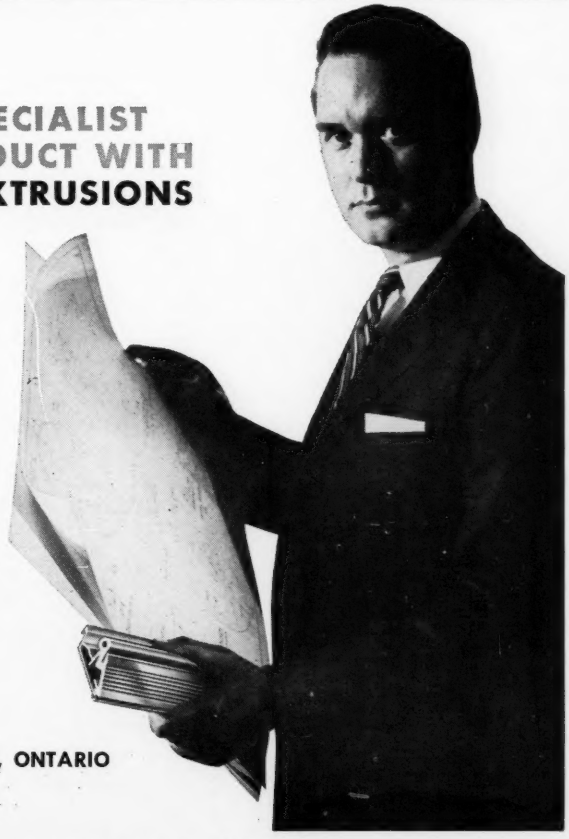
A design problem to solve? Reviewing your present product? Then consider what CREATIVE EXTRUDING can do to save you dollars. The WERNER specialist and his skilled engineering department can create custom aluminum extrusions that are more economical and more efficient. Designing? Reviewing? Considering? Then call for the WERNER representative . . . he is at your service.

"ALUMINUM EXTRUSIONS FOR PRODUCTS OF BETTER DESIGN"



WERNER ALUMINUM

R. D. WERNER CO. (CANADA) LIMITED, OSHAWA, ONTARIO

Circle number 158 on time saver card

New products

(Continued from page 72)

passage. The coolant flow is constrained to a narrow passage which spirals in-

ward toward the centre and then outward to the periphery of the diaphragm. This flow pattern, while covering the entire diaphragm face, prevents the coolant from shunting around a particularly hot area. This shunting effect occurs when the coolant vaporizes locally, thereby creating an obstruction to the flow. In this situation, the coolant will choose an alternate path if one is available, thus allowing the hot area to become progressively hotter. It is designed specifically for use in rocket research. **A. C. Wickman Ltd.** are the manufacturers. (217)

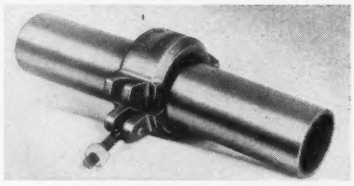
High temperature surface coating

Makers claim this clear epoxide surface coating has exceptional high temperature properties. It can be used continuously at 500 deg F and for short periods up

to 600 deg F. Moisture and chemical resistance is outstanding. Eccocoat C 26 is applied by dip, brush, or spray. Multiple coats are used in order to build up thickness. A maximum of 7 mils should be applied in a single coat. It is used for coating printed circuits boards, electronic circuits and components, metals and ceramics. It can also be used in place of varnish for dipping or impregnation of coils or motor windings. Adhesion to a wide variety of materials is excellent. Cure of the applied coating is extremely simple. **Emerson & Cuming Inc.** are manufacturers. (218)

Swing bolt coupling

A malleable iron Swing Bolt Coupling



has been announced by the **Charles E. Manning Co.**

Makers say the new swing bolt coupling cuts installation time and labor by 25% when applying couplings to grooved-end pipe. Simple to use, one man can apply the gasket, put the housing in position, swing the bolt closed and tighten the single nut in a matter of minutes.

The new swing bolt coupling is designed with a positive, safe locking device that can't snap open. (219)

Standard limit switches

A full line of long life, standard limit switches for aircraft, machine tools, appliances, vending machines and many

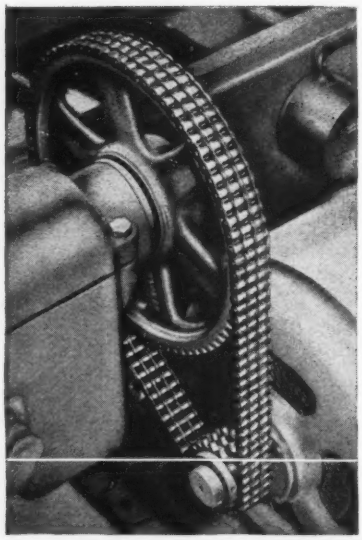
inplant uses has been introduced by Licon (R) Switch and Control Division of **Canada Illinois Tools, Ltd.**

The manufacturers states that the serpentine switch mechanism largely eliminates the problem of switch fatigue and assures positive actuation of equipment. Switches have no pivot points. (220)

A long run for your money

For conversions or new equipment specify **RENOLD stock chain drives.** Quiet, positive and smooth running, they will give you years of dependable, trouble-free service, outlasting other types of transmission many times.

Drives from fractional to 140 h.p. can be supplied **FROM STOCK** in 25 different ratios, easily selected from chart in our Catalogue Ref. 116/116



Only 17" centres could be allowed for this drive from motor to heavy machine and a RENOLD stock chain drive easily transmits the necessary power.

RENOLD

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Prompt deliveries up to 4000 h.p.

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Couplings, Gears, Clutches
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STOCK DELIVERIES
COAST TO COAST SERVICE
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901

RENOLD CHAINS CANADA LTD.

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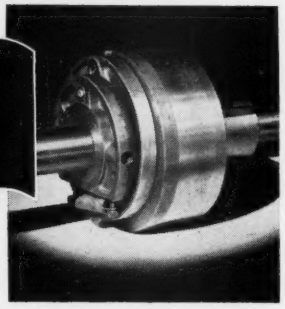
AGENTS: E. S. Stephenson & Co. Limited Halifax, N.S., Saint John, N.B. and Hugh J. O'Neill Limited, Noranda, P.Q., Timmins and Sault Ste. Marie, Ont.

Circle number 144 on time saver card

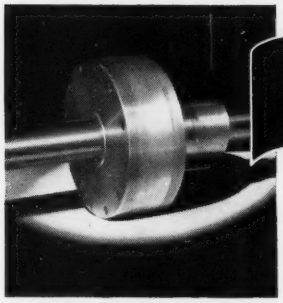
HILLIARD *Clutches*

FOR POWER CONTROL DESIGNS

HILLIARD SINGLE REVOLUTION CLUTCH



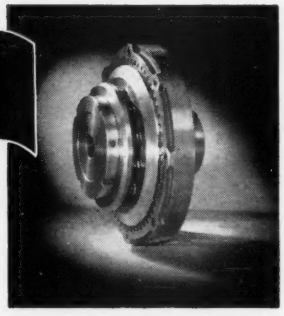
Unequalled for accurate control of intermittent machine operations — cutting, punching, and packaging. Gives closer tolerances to cut-off, stamping, shearing, and similar machines. Completely automatic; manual, mechanical, or electrical control.



HILLIARD OVER-RUNNING CLUTCH

Hilliard Over-Running Clutches and Couplings are automatic in operation. They are unexcelled for automatic two-speed drives, dual drives, stand-by drives, and for allowing machinery to "coast" after drive stops. Excellent as fixed or infinitely adjustable ratchets.

HILLIARD SLIP CLUTCH



A reliable series of spring-loaded slip clutches and couplings. Rugged construction with ample friction surface for heavy-duty use. Outstanding for preventing overloads and shocks; for starting heavy loads; as tension drag brakes; for reeling and winding operations; and many other uses.

Hilliard's Engineering Department is ready to assist you in designing installations and in selecting the correct clutch or coupling.
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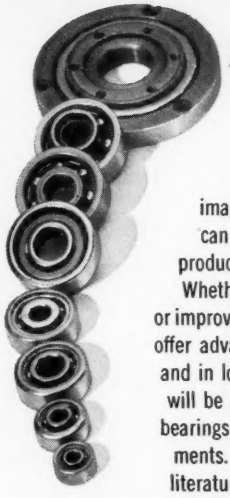
for design engineers

VERS-O-LINE

bearings by Hartford

ENGINEERED TO BE PART OF YOUR PRODUCT



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Vers-O-line bearings challenge the imagination. In many applications, they can be engineered so that parts of your product can form the inner or outer races. Whether you are designing a new product or improving an old one, Hartford Vers-O-lines offer advantages in performance, unitization and in low cost. Hartford bearing engineers will be glad to adapt or design Vers-O-line bearings to meet your exact product requirements. Write for comprehensive technical literature. Contains standard Vers-O-lines, case history applications, and bearing ideas that can be helpful to you.

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Circle number 127 on time saver card

Briefs

We note with interest . . .

that we are in danger of losing another of our freedoms—that stamping ground for barbers, bus-drivers, backyard neighbors — the weather. Some of those darned backroom boys in the States have been tinkering around with it till they can turn on rain and sunshine with the ease of a faucet . . . **an oil-cooled clutch** has been developed that will increase performance into the "phenomenal" class and has a life-span up to 10,000 hours . . . **many** engineers will cheer the news about a low-cost method for vacuum deposition of cadmium which makes it possible to protect high tensile steels against corrosion without danger of hydrogen embrittlement . . . **watch out** for vastly increased use of the new semi-rigid "foams" . . . **Will someone please tell us** what to do about the new stereophonic sound programs: we have a radio in the living-room and one upstairs — find the best listening-post is on the stairs, but it's hard on comfort . . . **you might be driving** a "frosted hardtop" soon. A new finish that resembles frosting is achieved by a blasting technique: all kinds of patterns are possible on stainless steel . . . **Maybe we can't** have the Arrow but according to a statement by the Postmaster General, Canada may get the world's first electronic mail sorting machine . . . **according to Arthur B. Tesmen** who attended the conference on vacuum technique in steel at the Academy of Science's Institute of Metals in Moscow last year, the Russians are well-versed in electroslag and friction welding techniques as well as Sputnik and Lunikniques . . . **while reading** through the 40-page Proceedings of the Lunar and Planetary Exploration Colloquium (Vol. 1, No. 3) recently, we noticed that there might be red chlorophyll on Mars. Pity the poor Martians—they'll never know when they have blood on their toothbrushes . . . **after many months** of intensive testing, the Caribou gross weight has been increased to 26,000 lbs. which provides a bigger payload . . . **the day we went** to press last month we were informed that a new ten million volt atom smasher had gone into operation at Chalk River . . . **apparently NATO** is interested in CanCars Bobcat (amphibious tracked carrier) . . . **new horizons of design** are possible with the photo forming technique. Parts too intricate for die stamping are "fabricated" with the camera — the only tooling is an accurate line drawing . . . we've **heard about** a graphite silicone paint that resists violent thermal shocks i.e., part it's coated with, is heated to 1,000 deg. F while simultaneously subjected to a stream of ice cold water: no peeling, cracking or flaking . . . **German taxi-drivers** think the staid London cab is the best. Reason: strong glass behind driver wards off thugs, it has narrow turning circle, has luggage platform and adequate headroom for a man wearing a top hat. Next time we sneak off to Europe for the weekend we'll pack our topper . . . **a new steel** named Strenlite has been marketed that has application where design calls for substantial reduction in deadweight among other things . . . **know any bright young engineers?** If you do, tell them about the 10 post-graduate fellowships for advanced studies at seven Canadian universities that have been established by Inco . . . **here are a few dates** for your deskpad — **April 5-7** in Cleveland; Fifth Nuclear Congress and Atomic Industrial Forum AtomFair: **April 6-7** in Toronto; Annual Conference of Industrial Accident Prevention Associations: **April 7-10** in Chicago; 40th Annual Convention and Welding Show of AWS: **April 20-21** in Philadelphia; Conference on Analog and Digital Instrumentation sponsored by ASME, IRE and the ISA: **May 11-13** in Chicago; Second Annual Joint Conference on Automatic Techniques: **May 25-June 19;** Executive Development Course

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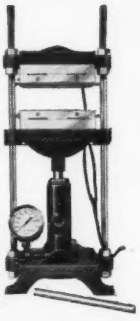
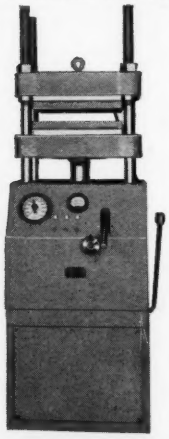
Every model is ruggedly constructed for a long service life and has features found only on Wabash Presses. Surface ground platens are heated with temperature range of 90 to 600° F. Pressure is easy to apply, easy to release. Can be used for pressing, forming, crushing, extruding, filtering, extracting laminating, molding and other operations. An indispensible tool for research, inspection and testing. Larger models available motorized. Also specially engineered units for particular requirements.



3-TON PRESS, MODEL 3-8.



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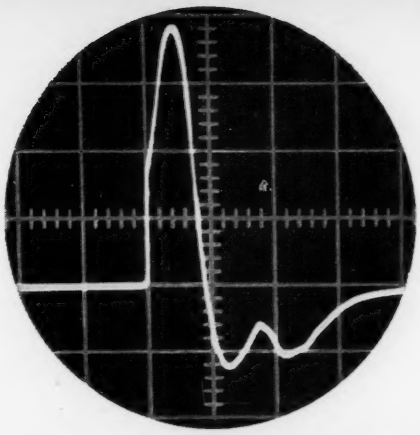
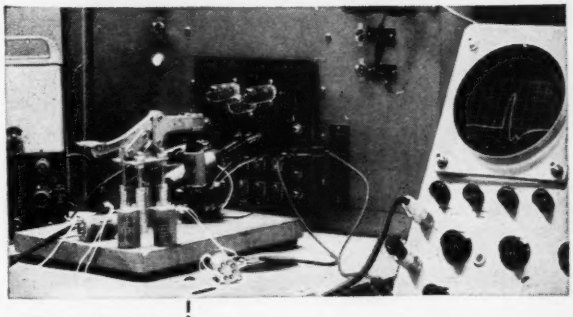


HAMMOND PULSE TRANSFORMERS



Test jig duplicating actual conditions the transformer will meet in service.

1

2

3

1. 0.65 μ Sec.
2. 0.6 μ Sec.
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Strict conformation to mechanical and electrical specification is ensured by 100% inspection.
Each Hammond Transformer is individually tested under working conditions in a duplicate of the circuit in which it will be used.

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H/10 **GUELPH ONTARIO CANADA**

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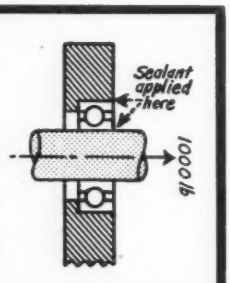
"WE THREW OUT PRESS FITS FOR BEARINGS...

"We used interference fits to prevent bearing races from turning in the gear box of our 4HP Turbo-sweeper. Maintaining close tolerances was a constant headache. If the fit was loose, the race would slip and fret the surfaces; if the fit was tight, the race would deform and bearing life would be shortened. Then we discovered LOCTITE Liquid Sealant would do away with the need for press fits. We opened up the tolerances for both shaft and housing and used a slip fit, filling the clearance with LOCTITE. The bearings are retained with a force equal to the customary interference fit, but we've reduced rejected parts from 8% to less than 1% and reworked parts fell from 20% to 0! Field reports are excellent."

LIQUID SEALANT . . . replaced interference fits and opened up tolerances almost 0.002 in. on shaft and housing for this ball bearing assembly. Load of over 1000 lbs. is needed to break bond.



LOCTITE is a penetrating liquid that hardens only after being confined between closely fitted metal parts. In the absence of air, the sealant hardens into a strong, heat and oil-resistant bond. The hardening action may be accelerated by heating.

LOCTITE eliminates the need for interference fits on bearings, sleeves, shafts and studs . . . locks nuts to bolts, seals pipe and tubing joints. Write for literature and free sample.

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601 Woodbine St., Hartford 6, Conn.

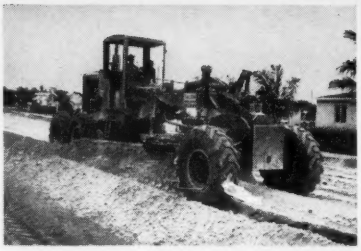
See LOCTITE in action — Booth F19, National Industrial Production Show, Toronto — May 4 through 8.

Circle number 104 on time saver card

Briefs *(Continued from page 76)*

at McGill University—this is four weeks of planned seminars with faculty members and distinguished visiting lecturers . . . **so many things** seem to be known by numbers these days — a new family of nitrile silicone rubbers sports fancy names like NSR-X5602, NSR-X8701 and NSR-X4803. We pity poor mother calling the boys in for lunch . . . **the Air Registration Board** of GB has OK'd the Rolls-Royce Conway by-pass turbo jet at 18,000 lb thust . . . **always glad to spout** about Canadian "firsts" and here's a dandy. Maple-leaf-land has developed the largest, most complex plastics item ever produced by a compression molding technique. It is a reinforced plastics wheel for tracked military vehicles consisting of two parts 23 in. in diameter, each weighing nearly 40 lbs. Lab tests showed wheel could carry over 16 tons . . . **ever hear of** the Lace Pattern Readers, Correctors, Press and Piano Punchers Union? Neither had we till the other day. It's a U. K. outfit, boasts 14 members and used to have its own president. "But he left some time ago," says secretary Burgess, "and we've never bothered to have another . . . " **according to the Japanese** magazine "Wool" there's a word for the chlorinated compound used as a mothproofing agent in wool—it is "Hexachloroepoxyoctahydroendoexo-dimethanonaphtalene" Oh, mothballs! . . . **something else new** is a corrosion resistant plastic exhibiting outstanding properties mechanical, thermal and electrical-wise . . . **the Society** for Non-Destructive Testing is conducting a magnetic particle educational program in Montreal — intend to make it a yearly feature . . . **we read a report** somewhere that Russia graduates more women engineers every year than the U. S. has in its entire history. Perhaps by our standards the "engineers" are actually technicians — but it makes you think . . . **the American Society** for Testing Materials will organize a new division on Materials Sciences. Aim: to co-ordinate and intensify, the development of knowledge of the fundamentals of materials . . . **diplomacy:** the art of convincing one's wife she looks fat wearing a mink coat . . .

Brief Talepiece: In the letter to the editor columns of a recent issue of the Toronto Globe & Mail, a correspondent said that engineering students are very ignorant. "I have yet to see one reading a newspaper, let alone discussing public affairs with the slightest degree of intelligence." He went on to say that the professor of engineering at a well-known Canadian university told him that if they were painted black, his engineering students would look even more like the savages they were! We are awaiting the fireworks display. ★



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For general information, write for Bulletin 557.

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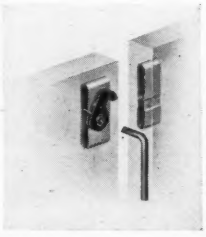

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FACTS YOU should know about malleable iron

FACT No. 6 . . .

It is Wear Resistant

If you have a problem of metal-to-metal abrasive wear on a part, you will find that malleable iron has greater resistance than other ferrous metals of comparable strength. The reason for this is because of the "self-lubricating" action of the graphite particles which are inherent in the composition of malleable iron. This graphite content reduces the friction between moving parts and so gives you a material that lasts longer and performs better. Remember, too, that wear resistance is just one of the outstanding properties of malleable iron—in addition you get exceptional strength, design adaptability, easy machinability, cold working properties and resistance to corrosion.

So, when you have a part that has to withstand wear, look into the possibilities of using malleable iron. We here at Galt Malleable Iron Company will be glad to consult with you and show you how you can improve your product with malleable iron. Just drop us a line.

SEE WHAT MALLEABLE IRON WILL DO FOR YOU.

GALT
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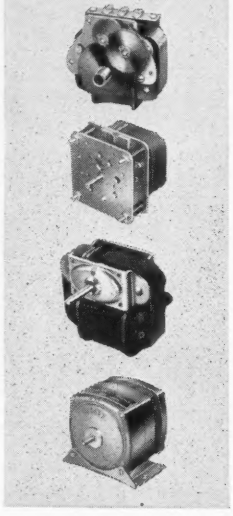

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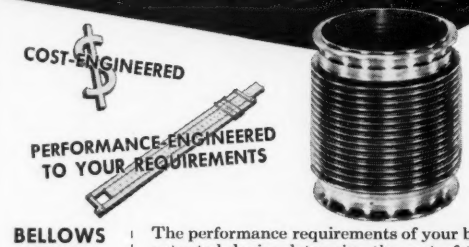
FLEXON METALLIC BELLOWS



BELLOWS DESIGN GUIDE

Send for your copy containing complete data. This up-to-date information on bellows application will save many hours' research.

The performance requirements of your bellows-actuated device determine the cost of the bellows. Flexon Bellows can be produced to meet any specifications, but there is no reason why they should *exceed* necessary standards. This only adds extra cost without improving performance.

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B-49

Flexonics

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BRAMPTON, ONTARIO

Manufacturers of flexible metal hose and conduit, expansion joints, metallic bellows and assemblies of these components

Formerly Canadian Metal Hose Corporation, Ltd.

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ALL POSITION— HIGH SPEED— LOW COST— mild steel welding with CO_2 shielding gas

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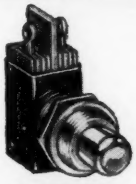

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Editorial

A most encouraging start

A Canadian non-trading association, for promoting and developing the wider use of copper and its alloys, has just been formed.

The first annual meeting of this Canadian Copper and Brass Development Association was held in the Territories Room of the Royal York Hotel, Toronto last month.

Attendance was excellent and some members came from as far afield as Vancouver and Winnipeg. The president, J. S. Vanderploeg (of Anaconda American Brass Ltd.) points out that the Association will work closely with similar organizations in other parts of the world and that it is a member of the Copper Development Directors Committee, an international group for the free interchange of technical and promotional data.

Membership is open to all producers of copper (and its alloy constituents) and to manufacturers of copper and copper alloy products.

You may remember that reference was made (in the December 1958 editorial) to the Brass and Bronze Ingot Institute in the U. S.

Production Show

Elsewhere in this issue you will find highlights from the National Production Show of Canada and the Canadian Welding Society technical sessions, to be held in Toronto, May 4-8.

The Show will be opened by the Hon. Leslie M. Frost, Premier of Ontario, at the request of the Canadian Industrial Management Association (one of the four societies sponsoring the Show) who are holding a seminar on the afternoon of the first day, the guest speaker at which will be professor-of-economics, Marvin J. Barloon of Western Reserve University, Cleveland, Ohio.

On many occasions Premier Frost has stressed how important it is for Canadian industry to keep abreast of technological advances in production methods and equipment.

William Morse.

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APRIL 1959

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- ☐ Panel layouts the pin-up way
- ☐ Special hydraulic valve systems
- ☐ 1959 Industrial Production Show
- ☐ New method of precision finishing
- ☐ Torsion bar springs
- ☐ Castings: new process
- ☐ Involute splines
- ☐ Porcelain enamel (data sheet)

New Products and Literature

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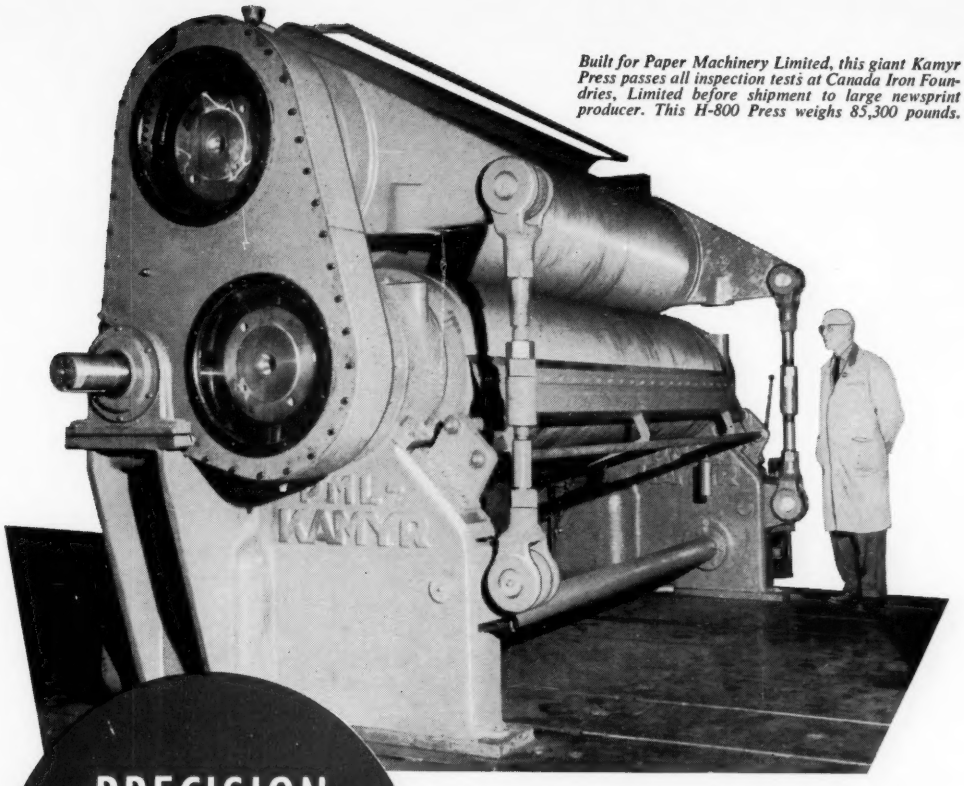

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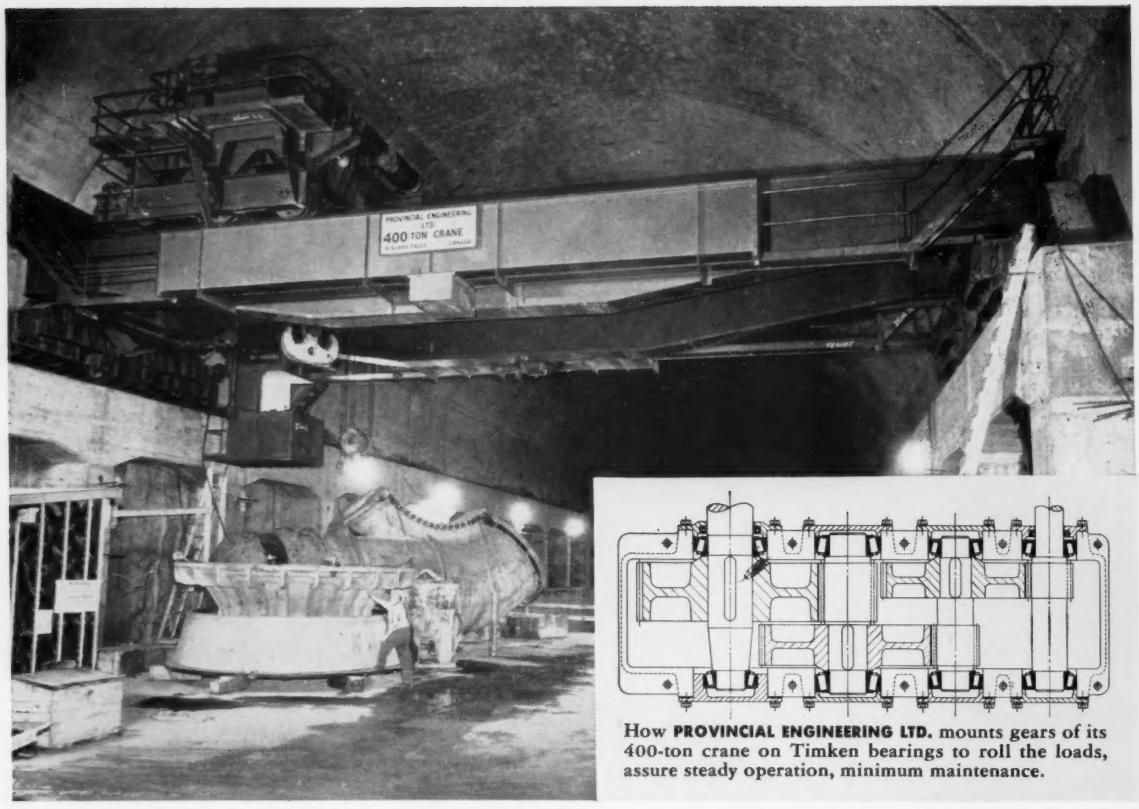

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Provincial 400-ton crane handles powerhouse giants with 38 TIMKEN bearings to roll the loads

TO roll the terrific loads set up in handling giant equipment in powerhouses, this 400-ton, 5-motor crane has 38 Timken tapered roller bearings at vital points. Provincial Engineering Ltd. uses Timken bearings in the two main hoist gear cases, auxiliary hoist gear case, trolley travel gear case and bridge travel gear case to assure long life and smooth operation with a minimum of maintenance.

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And Timken bearings are geometrically designed and precision-made to roll true. They practically eliminate friction—*roll* the loads. The crane operates smoother, easier. And Timken bearings make closures more effective because they keep shafts concentric with housings. Dirt stays out; lubricant stays in; maintenance stays down.

Timken bearings help make machines better. Better machines make better products. That's Better-ness. Specify Timken bearings for the machines you buy or build. The trade-mark "TIMKEN" is your symbol of Better-ness. The Timken Roller Bearing Company, Canton 6, Ohio, U.S.A. **CANADIAN PLANT:** St. Thomas, Ontario. Cable: "TIMROSCO". Makers of Tapered Roller Bearings, Fine Alloy Steels and Removable Rock Bits.

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